



COMMONWEALTH OF PENNSYLVANIA
PUBLIC SCHOOL EMPLOYEES' RETIREMENT SYSTEM

Private Markets Asset Class Review Year-End 2017

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October 11, 2018

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Executive Summary

Update as of December 31, 2017:

- \$7.6B NAV, 206 active funds, 69 GP's (managers)
- 18.5% Net IRR for the one-year 2017
- 11.4% since inception Net IRR performance vs. Burgiss All Private Markets Benchmark 6.1% and MSCI World Index 9.1%
- 2011 to 2017 commitments have a 17.3% Net IRR (*4% Direct Alpha)
- Private Markets Co-Investments have a 27.8% Net IRR since inception (*13% Direct Alpha)
- Negotiated management fee savings of approximately \$160M and profit share savings of approximately \$33M to date
- An additional management fee and profit share savings of approximately \$41M due to the in-house co-investment program
- Total savings of \$234 million

*70% Russell 3000/30% MSCI ACWI xUS Custom Index

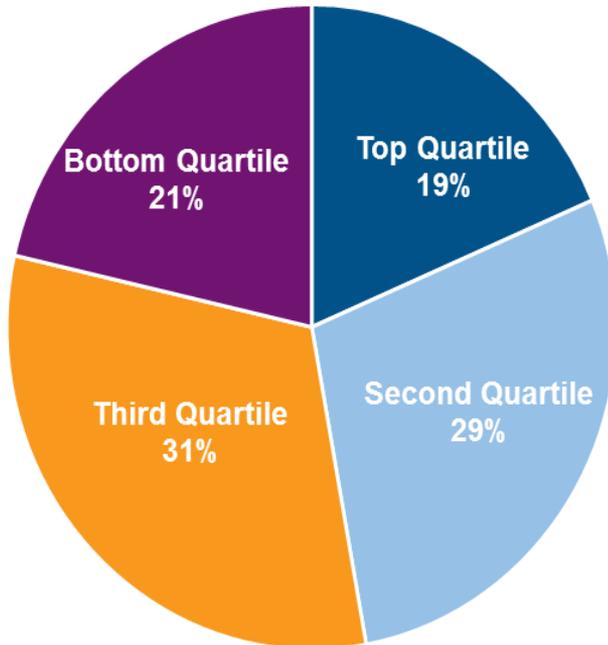
Private Markets Staff – Benefitting from Longevity

Name	Years at PSERS	Years of Professional Experience
Charles Spiller	24	43
Darren Foreman	22	25
Luke Jacobs	20	22
Mike Tyler	11	11
James Del Gaudio	3	14
Tony Meadows	8	8
Michael Benson	3	21
Patrick Knapp	1<	10

PM Staff Ability to Pick Good Funds Has Improved Significantly as of December 31, 2017

PSERS Portfolio Exposure by Quartile

Vintage Years 2005 - 2008, by Fund Count

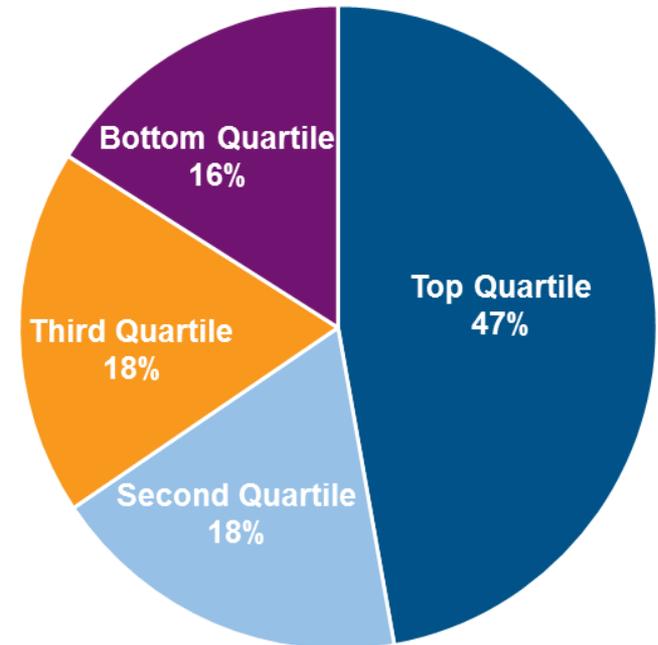


Source: Hamilton Lane Data. As of 12/31/2017 (July 2018).

Vintage Years – 2005-2008

PSERS Portfolio Exposure by Quartile

Vintage Years 2011 - 2015, by Fund Count



Source: Hamilton Lane Data. As of 12/31/2017 (July 2018).

Vintage Years – 2011-2015

Private Markets Quarterly Update

Performance	1-QTR ¹	1-YR ¹	3-YR ¹	5-YR ¹	10-YR ¹	Since-Inception ¹
Final - 4Q17	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%
Benchmark ²	3.91%	17.00%	11.02%	12.45%	8.35%	6.06%
MSCI World Net Total Return USD Index - 12/31/2017					5.90%	9.11%
Preliminary - 1Q18 ³	1.92%	16.42%	10.90%	10.23%	7.30%	11.39%
Benchmark ⁴	2.18%	15.87%	11.47%	12.41%	8.71%	6.12%
Blended 70% Russell 3000 / 30% MSCI ACWI x US Index as of 3/31/2018 ⁵					6.26%	9.09%

¹ Dollar-weighted (IRR)

² Burgiss Index All Private Markets - 12/31/2017 - Source: AON (As provided by PSERS)

³ 1Q18 metrics reflect preliminary data and may be changed due to increased information received by the general partners of the underlying investments

⁴ Burgiss Index All Private Markets - 3/31/2018 - Source: AON (As provided by PSERS)

⁵ Since Inception Blended Index Return unavailable; thus, Since Inception MSCI World Net Total Return USD Index – Source: Bloomberg (as provided by PSERS) reflected

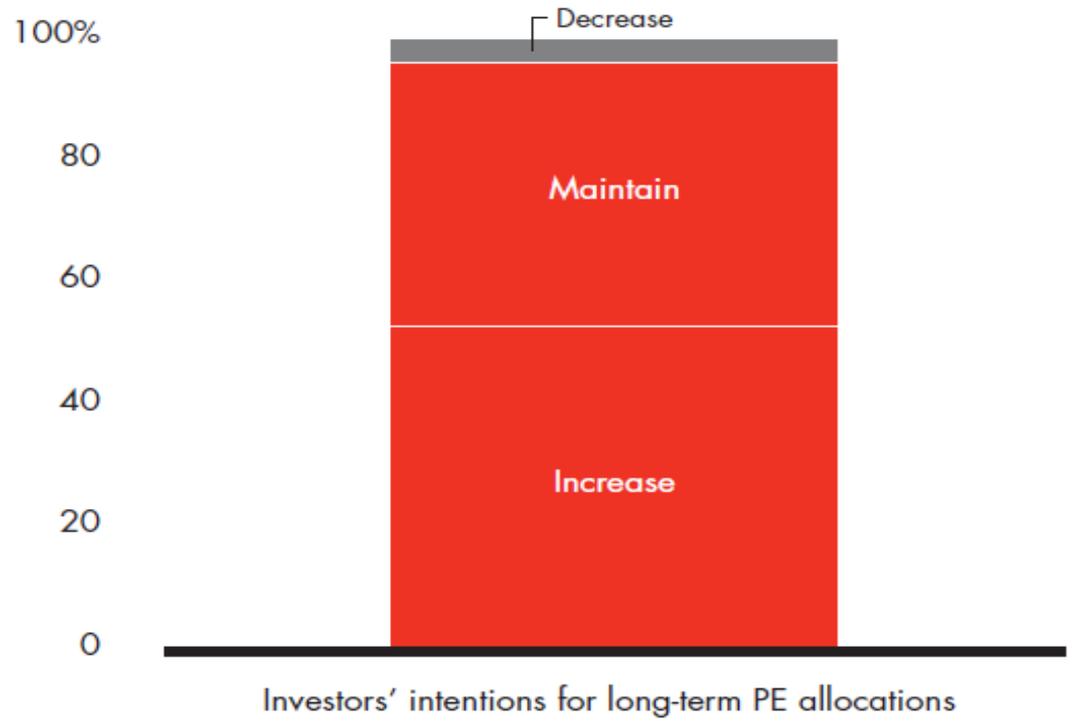
Cash Flow Activity - Final - 4Q17 (\$M)

	New Commitments	Contributions	Distributions	Residual Value	Unfunded
Quarter	\$264.3	\$334.8	\$845.1		
YTD	\$1,325.8	\$1,316.3	\$2,808.7		
ITD	\$30,281.2	\$26,447.3	\$32,191.4	\$7,642.4	\$4,724.4

LP's remain committed to Private Markets

96% plan to raise or maintain their long-term PE allocations

Percentage of LPs surveyed



Source: Preqin survey, December 2017

Key Takeaways - Private Markets

- Private Markets portfolio has generated strong, double digit long term performance since inception
- Portfolio will remain focused on high conviction managers with the potential to generate low to mid-teens net returns
- The Private Markets Program has been self-funded in that distributions have covered contributions for the period 2010 - 2017

- Private Equity:
 - We will opportunistically add new GPs that have a proven ability to add value to their portfolio companies, along with top quartile performance

- Co-Investment:
 - Portfolio has generated strong returns, exceeding expectations
 - Deal flow has been very good
 - Will aim to increase the NAV to 10% of private markets exposure over the next 3 years

- Venture Capital:
 - Will look to add some new emerging venture capital funds

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Net IRR Performance by Strategy

as of December 31, 2017

Strategy	NAV	MoC	1-QTR IRR	1-YR IRR	3-YR IRR	5-YR IRR	10-YR IRR	Since Inception IRR
Special Situations	14.6%	1.5x	6.32%	17.61%	5.85%	7.81%	8.18%	13.19%
Venture Capital	12.4%	1.4x	4.39%	17.28%	8.08%	10.52%	4.64%	7.38%
Private Equity								
Large Buyout	12.3%	1.4x	7.08%	18.98%	10.14%	9.46%	7.13%	9.77%
Middle Market Buyout	46.9%	1.6x	4.35%	18.81%	12.27%	10.85%	6.87%	11.67%
Secondary	7.5%	1.5x	5.90%	17.47%	6.39%	9.71%	6.08%	19.79%
PE Internal Program	6.3%	1.7x	0.50%	20.23%	22.82%	26.86%	N/A	27.75%
Subtotal Private Equity	73.0%	1.5x	4.60%	18.83%	11.83%	10.89%	7.12%	11.92%
Total Portfolio	100.0%	1.5x	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%
Private Equity Domestic	42.1%	1.5x	3.05%	15.35%	11.94%	10.96%	6.54%	11.08%
Private Equity International	30.9%	1.6x	6.76%	23.44%	11.70%	10.81%	8.08%	14.23%

¹ PE Internal Program performance excludes Wilson currency hedge

Performance Summary by Vintage Year – Last 10 Years

Vintage Year	Total Exposure	MoC	Since Inception IRR
2008	\$1,079.2	1.4x	10.23%
2009	206.0	2.0x	17.20%
2010	10.1	1.1x	1.36%
2011	810.4	1.4x	13.73%
2012	1,386.3	1.6x	18.14%
2013	1,114.4	1.4x	18.18%
2014	855.1	1.4x	20.96%
2015	1,790.8	1.2x	13.07%
2016	1,452.4	1.3x	34.51%
2017	1,590.2	1.0x	3.36%
Total Portfolio	\$12,366.8	1.5x	11.41%

Performance vs. Benchmark

PSERS Private Markets Portfolio Performance Summary by Strategy as of December 31, 2017						
Strategy	1-QTR IRR	1-YR IRR	3-YR IRR	5-YR IRR	10-YR IRR	Since Inception IRR
Private Equity	5.01%	18.80%	11.19%	10.39%	6.87%	11.82%
Venture Capital	4.39%	17.28%	8.08%	10.52%	4.64%	7.38%
Special Situations	6.32%	17.61%	5.85%	7.81%	8.18%	13.19%
PE Internal Program	0.50%	20.23%	22.82%	26.86%	N/A	27.75%
Total Portfolio	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%
Burgiss All Private Markets	3.91%	17.00%	11.02%	12.45%	8.35%	6.06%
MSCI World Net Total Return USD 12/31/2017					5.90%	9.11%

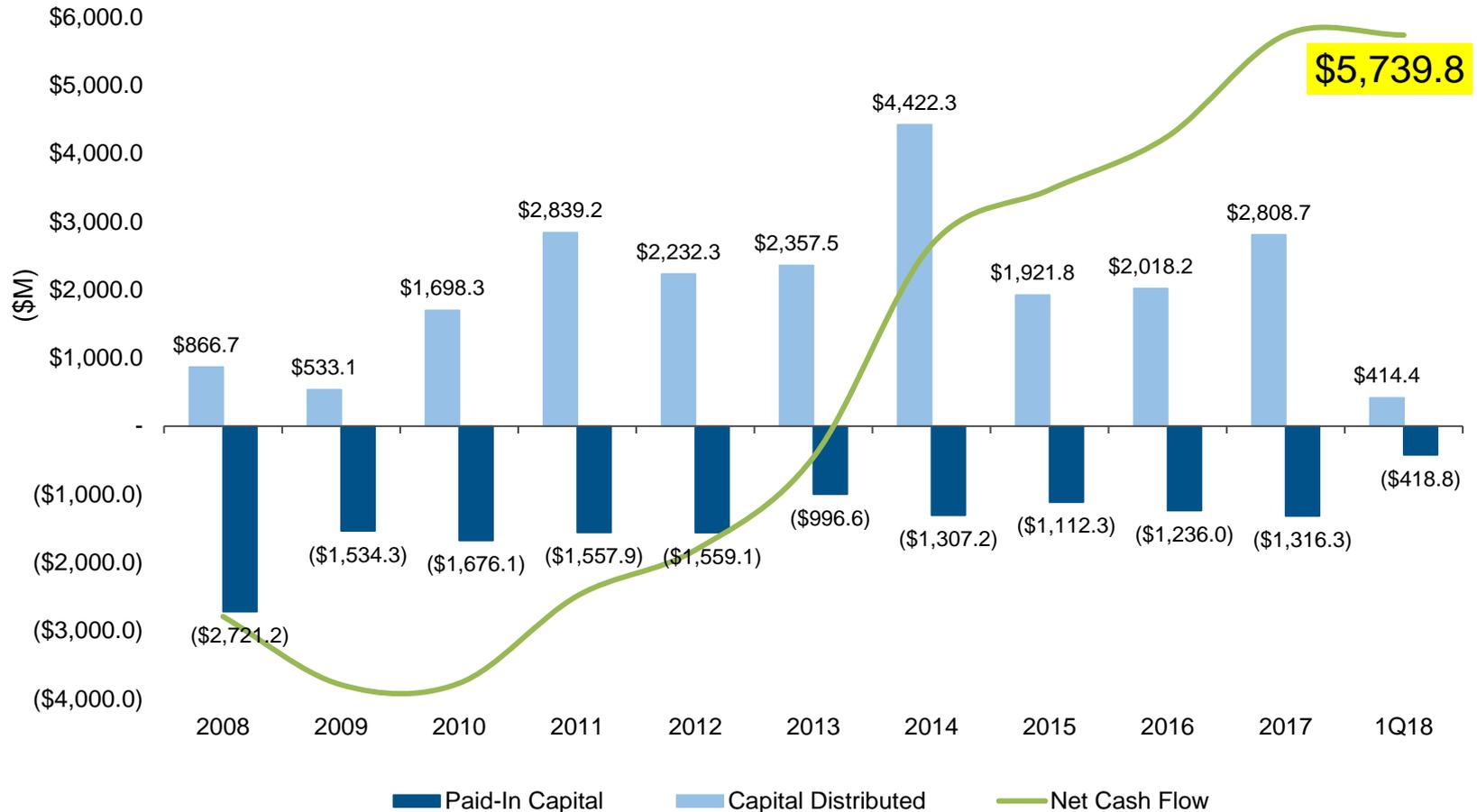
¹ PE Internal Program performance excludes Wilson currency hedge

² Source: AON (as provided by PSERS)

³ Source: Bloomberg (as provided by PSERS)

Cash Flow: 2008 through March 31, 2018 (Preliminary)

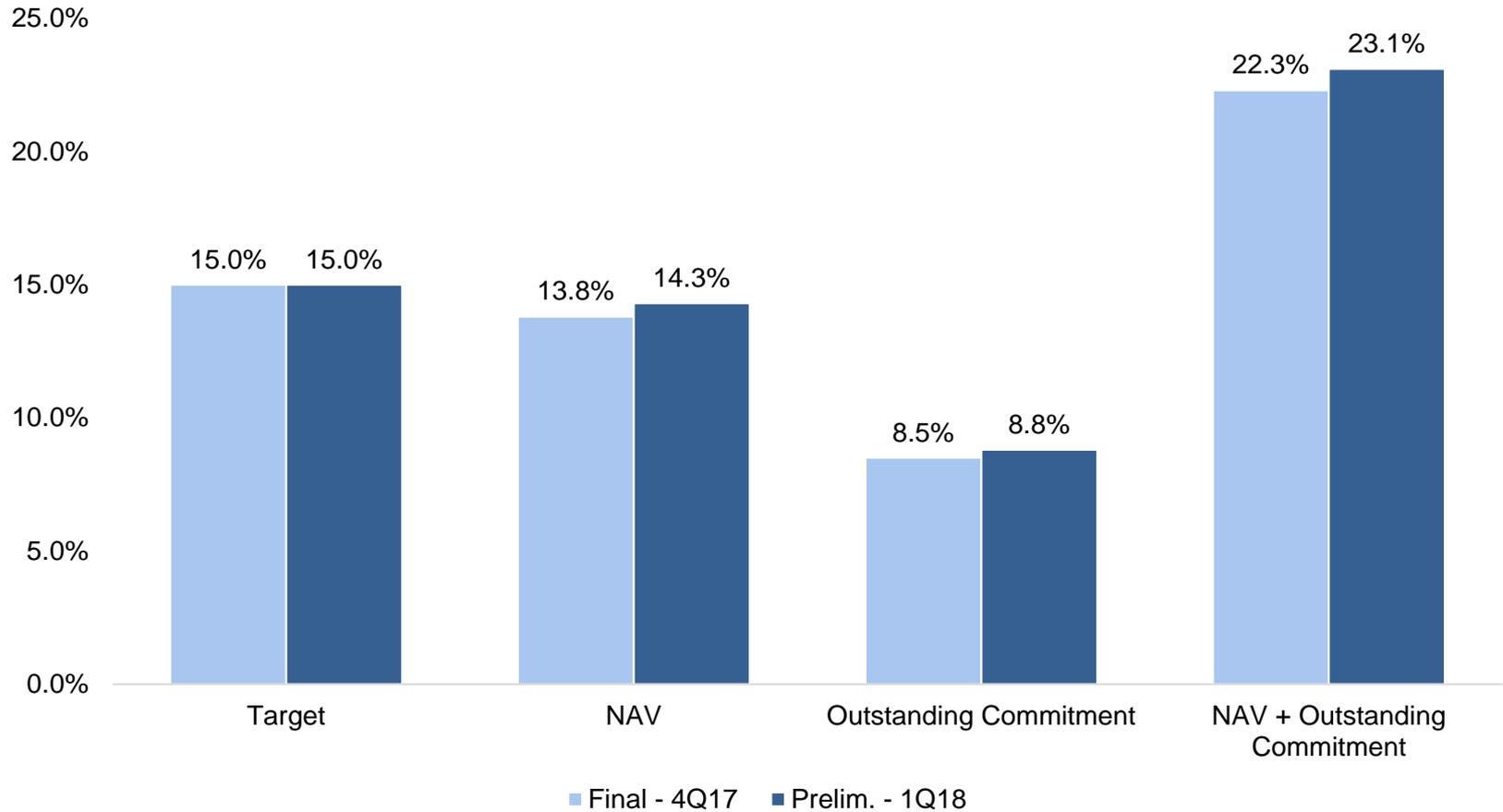
Private Markets Portfolio Cash Flow



Private Markets Portfolio Asset Allocation

(PSERS' Total Fund as of December 31, 2017 \$55.3)

(PSERS' Total Fund as of March 31, 2018 \$54.3)

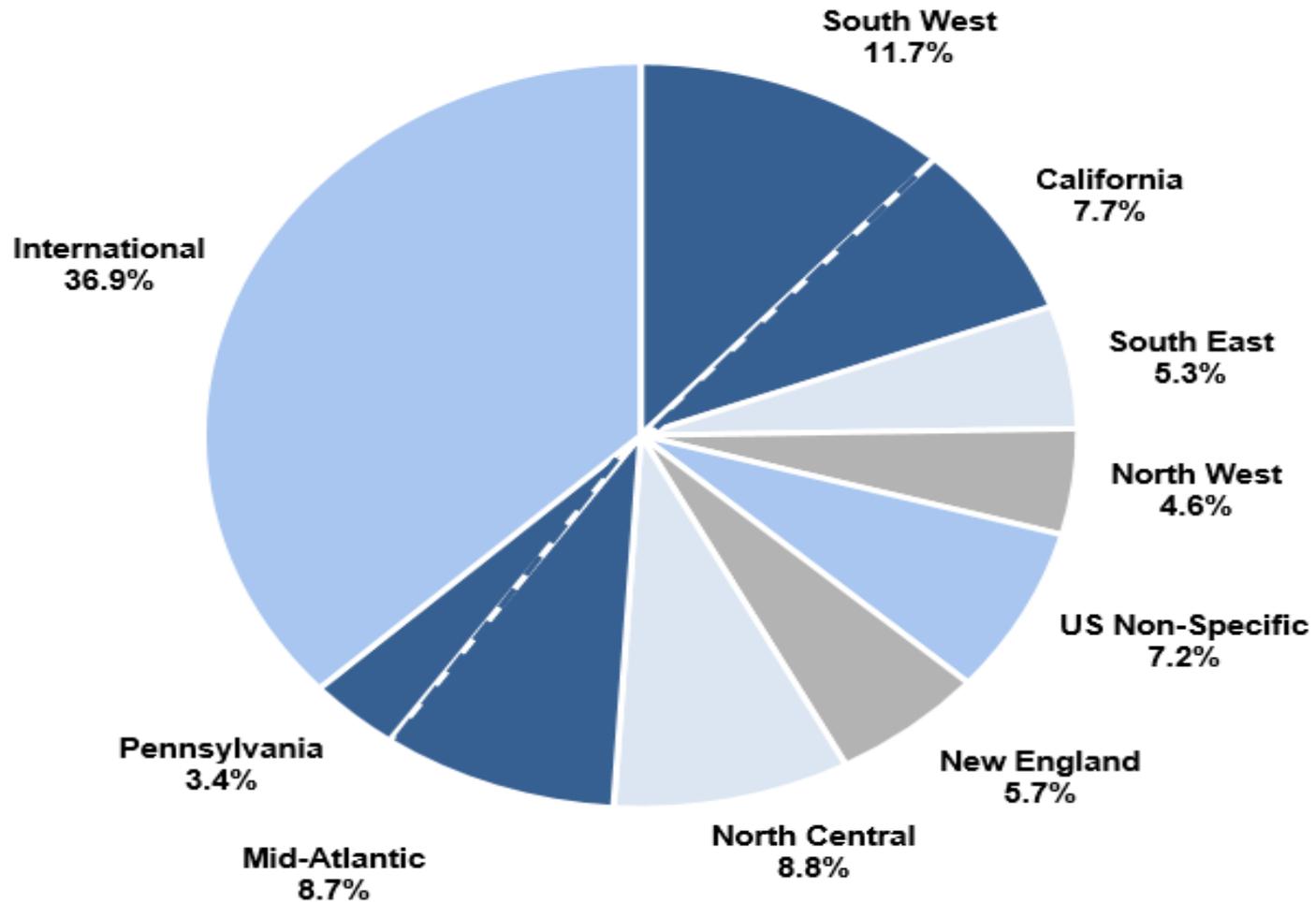


Note: The Private Markets Target includes Private Equity, Venture Capital, Special Situations, and PEIP investments.



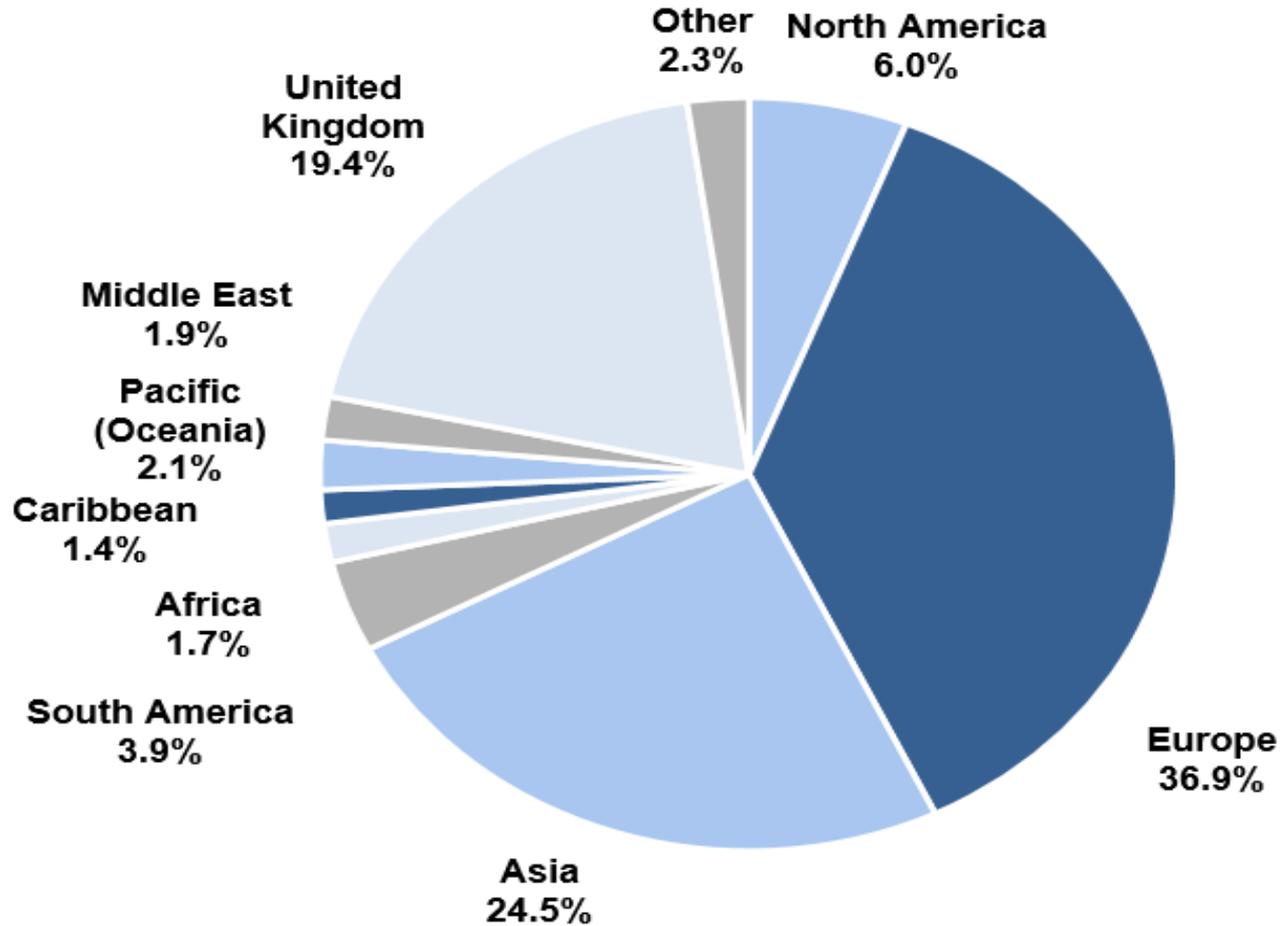
Regional Distribution by Market Value

as of December 31, 2017



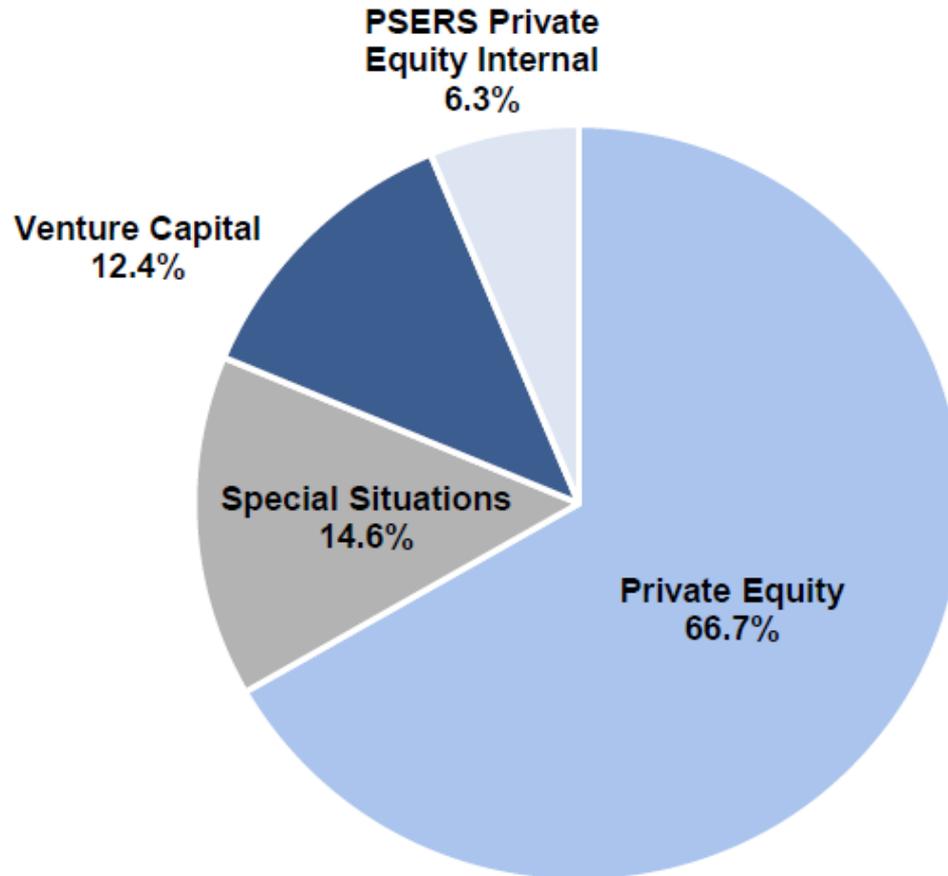
International Distribution by Market Value

as of December 31, 2017



Private Markets Portfolio by Investment Style

As of December 31, 2017



Commitments Approved and Executed Since October 1, 2017

Commitments Approved and Executed (Since October 1, 2017)					
Fund Name	Type of Document	Date of Board Approval	Commitment Amount (\$M)	Tranche	Date Executed
Portfolio Advisors Secondary Fund III, L.P.	New	10/5/2017	\$125.0	PE	12/28/2017
PA Portfolio Advisors Secondary Fund, LP	New	10/5/2017	\$200.0	PE	5/4/2018
PAI Europe VII, L.P.	New	10/5/2017	€100.0	PE	3/5/2018
Orchid Asia VII, L.P.	New	10/5/2017	\$75.0	PE	12/14/2017
Clearlake Capital Fund V, L.P. ¹	New	12/8/2017	\$100.0	SS	12/29/2017
Insight Venture Partners X, L.P.	New	12/8/2017	\$100.0	VC	2/1/2018
Equistone Partners Europe Fund VI, SCSp ²	New	12/8/2017	€75.0	PE	3/5/2018
Bridgepoint Europe VI, L.P.	New	12/8/2017	€100.0	PE	4/4/2018
Blue Point Capital Partners IV, L.P.	New	12/8/2017	\$70.0	PE	1/24/2018
K4 Private Investors, L.P.	New	3/9/2018	\$100.0	PE	5/29/2018
Webster Capital IV, L.P.	New	3/9/2018	\$75.0	PE	6/19/2018
Platinum Equity Small Cap Fund, L.P.	New	3/9/2018	\$200.0	PE	5/9/2018
Trilantic Capital Partners VI (North America), L.P.	New	5/24/2018	\$150.0	PE	8/10/2018

¹ Commitment of \$200M was approved by PSERS' Board on 12/8/2017. Final commitment was reduced to \$100M.

² Commitment of €85M was approved by PSERS' Board on 12/8/2017. Final commitment was reduced to €75M.

Private Markets Portfolio Snapshot at Year-end 2016 and 2017

PSERS Private Markets Portfolio			
(USD in Millions)	12/31/2016	12/31/2017	Change
Total Active Partnerships	203	206	3
Total Inactive Partnerships	71	88	17
Active GP Relationships	73	69	(4)
Capital Committed ²	\$27,753.7	\$30,281.2	\$2,527.5
Unfunded Commitment	\$3,988.2	\$4,724.4	\$736.2
Paid-In Capital	\$25,131.0	\$26,447.3	\$1,316.3
Capital Distributed	\$29,382.7	\$32,191.4	\$2,808.7
Market Value	\$7,789.2	\$7,642.4	(\$146.8)
<i>Private Equity</i>	\$5,310.2	\$5,095.2	(\$215.0)
<i>Special Situations</i>	\$1,061.0	\$1,114.5	\$53.5
<i>Venture Capital</i>	\$950.2	\$950.5	\$0.3
<i>Private Equity Internal Program</i>	\$467.8	\$482.2	\$14.4
Total Value Multiple	1.48x	1.51x	0.03x
Avg. Age of Commitments	9.1 years	9.3 years	0.2 years
Since Inception Net IRR	11.23%	11.41%	18 bps

¹ The Private Markets Portfolio includes Private Equity, Venture Capital, Special Situations, and PEIP investments

² The change in capital committed during the period is attributable to fluctuations in exchange rates for non-US denominated funds and new commitments made during the period.

PE Internal and Pennsylvania Co-Investment

as of December 31, 2017

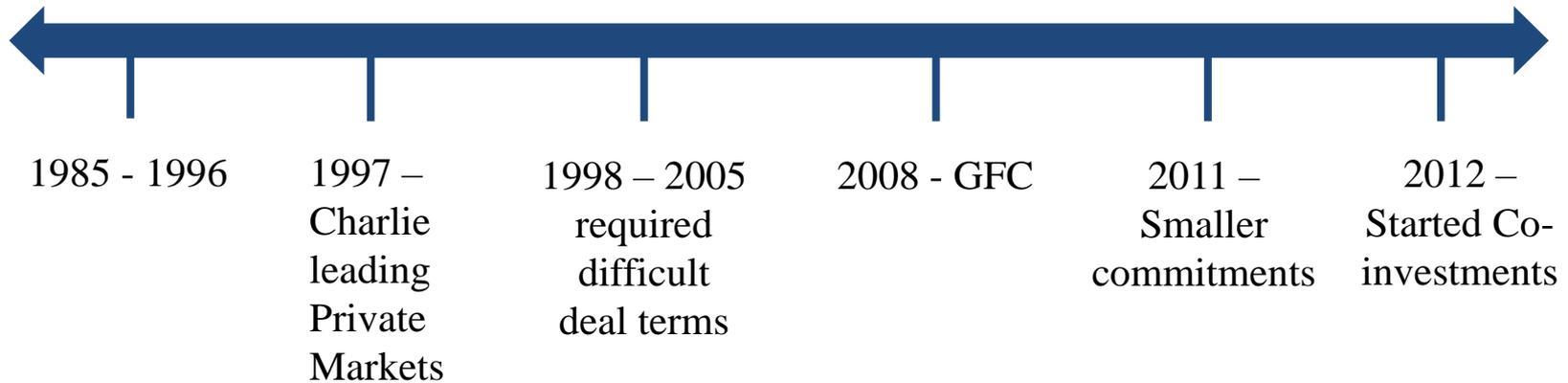
(\$mm)	Private Equity			Pennsylvania Co-Invest	Total Program
	Fund I	Fund II	Total**		
Performance (net of fees):					
Inception Net IRR	28.4%	1.0%	27.5%	31.6%	27.8%
Benchmark *	15.8%	16.0%	15.9%	20.0%	16.2%
Direct Alpha	12.5%	-15.0%	11.6%	11.7%	11.6%
1-Quarter (Net TWR)	-0.7%	1.4%	-0.6%	6.5%	0.3%
1-Year (Net IRR)	19.9%	n/a	14.7%	44.4%	17.4%
3-Year (Net IRR)	23.0%	n/a	22.0%	33.4%	22.8%
5-Year (Net IRR)	27.4%	n/a	26.6%	0.0%	26.9%
Inception Net Multiple	1.89x	1.02x	1.72x	1.65x	1.71x
Commitment Summary:					
Authorized			\$ 500.0	\$ 250.0	\$ 750.0
Outstanding Cost	\$ 245.4	\$ 79.5	\$ 324.9	\$ 37.8	\$ 362.7
Unfunded Commitments	\$ 46.4	\$ 3.9	\$ 50.3	\$ 2.8	\$ 53.1
Available			\$ 124.8	\$ 209.4	\$ 334.2
Flows & Valuations:					
Contributions	\$ 331.1	\$ 79.5	\$ 410.4	\$ 40.1	\$ 450.5
Distributions	\$ 289.6	\$ -	\$ 287.7	\$ 2.3	\$ 290.0
Valuations	\$ 337.4	\$ 80.8	\$ 417.4	\$ 64.0	\$ 481.4

* DJ Wilshire 5000 Index

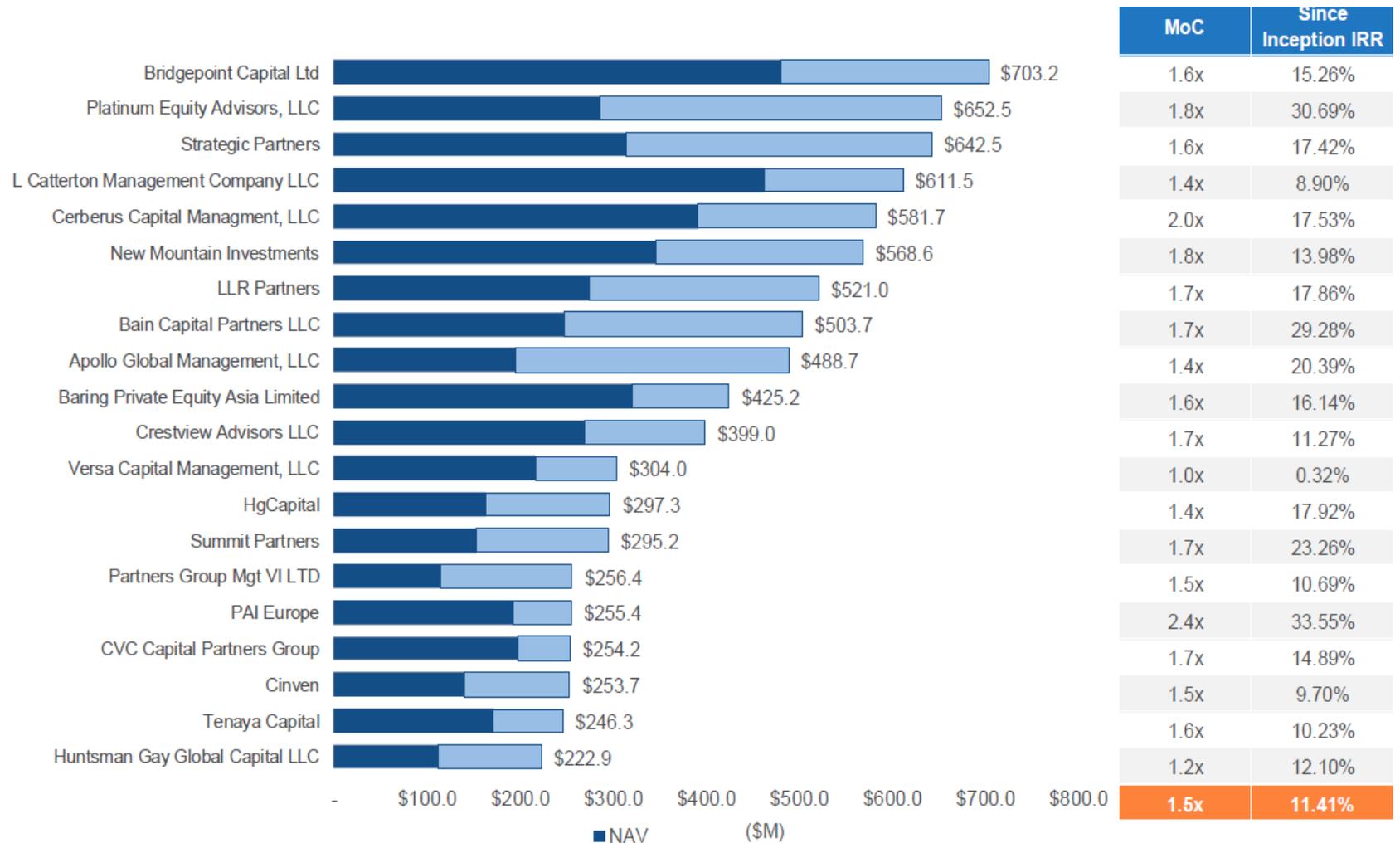
** Total column includes currency hedge

Private Markets Timeline of Events

- 1985 - Inception of PM Program
- 1997 - Charlie appointed to lead PM and RE
- 1998 to 2005 – Difficult deal terms which limited investable universe
- 2008 - Global Financial Crisis (frozen from commitments July 08 to Dec 10)
- 2011 – Started to make investments after being frozen & smaller budget
- 2012 – Inception of the internal co-investment program



Top 20 GPs by Total Exposure (NAV + Unfunded) as of December 31, 2017



Net IRR Performance Summary by Geography

as of December 31, 2017

Fund Geography	NAV	TVPI	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Asia	\$641.9	1.6x	8.01%	26.28%	10.04%	11.30%	8.69%	13.94%
Global	1,499.7	1.4x	5.18%	14.78%	4.07%	5.60%	7.28%	8.62%
North America	4,205.3	1.5x	3.03%	15.65%	11.84%	12.16%	6.77%	10.81%
Western Europe	1,295.5	1.7x	8.14%	27.85%	16.37%	12.51%	7.95%	17.30%
Total	\$7,642.4	1.5x	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%

Last Twelve Months (LTM) Net Value Drivers

Funds that Called the Most Capital During the Year (\$M)

Investment	VY	Strategy	Contributions	% of Total
Platinum Equity Capital Partners IV, L.P.	2016	Private Equity	\$75.0	5.7%
Strategic Partners Fund VII, L.P.	2016	Private Equity	\$73.1	5.6%
Cerberus Institutional Partners VI, L.P.	2015	Special Situations	\$62.5	4.7%
Bridgepoint Europe V, L.P.	2015	Private Equity	\$50.0	3.8%
Bain Capital Asia Fund III, L.P.	2016	Private Equity	\$46.8	3.6%
Total			\$307.4	23.4%

Funds that Distributed the Most Capital During the Year (\$M)

Investment	VY	Strategy	Distributions	% of Total
Baring Asia Private Equity Fund IV, L.P.	2007	Private Equity	\$305.0	10.9%
CVC European Equity Partners V, L.P.	2008	Private Equity	\$188.7	6.7%
New Mountain Partners III, L.P.	2007	Private Equity	\$96.5	3.4%
PAI Europe V	2008	Private Equity	\$82.6	2.9%
Cerberus Institutional Partners V, L.P.	2012	Special Situations	\$79.4	2.8%
Total			\$752.2	26.8%

Top & Bottom LTM Portfolio Drivers

Top & Bottom LTM Portfolio Drivers

Top LTM Contributors as Measured by Net Value Change (\$M)					
Investment	VY	LTM Appreciation	NAV	1-YR IRR	Since Inception IRR
CVC European Equity Partners V, L.P.	2008	\$78.7	\$142.8	51.71%	15.66%
LLR Equity Partners IV, L.P.	2013	\$55.6	\$177.6	39.38%	25.51%
New Mountain Partners III, L.P.	2007	\$50.6	\$207.0	24.40%	13.54%
Platinum Equity Capital Partners III, L.P.	2012	\$50.4	\$160.1	37.14%	34.77%
Bain Capital Asia Fund II, L.P.	2012	\$49.6	\$101.0	61.88%	26.42%
Appreciation (Top 5)		\$284.9	\$788.5	39.80%	17.13%
Appreciation (Remaining 144)		\$1,280.1	\$5,975.0	24.12%	11.50%
Total Appreciation (149)		\$1,565.0	\$6,763.5	25.46%	11.81%
Top LTM Detractors as Measured by Net Value Change (\$M)					
Investment	VY	LTM Appreciation	NAV	1-YR IRR	Since Inception IRR
Platinum Equity Capital Partners II, L.P.	2007	(\$46.8)	\$48.3	(41.54%)	13.05%
Apax Europe VII-A, L.P.	2007	(\$29.6)	\$56.7	(29.92%)	4.98%
Capital International Private Equity Fund V, L.P.	2007	(\$13.6)	\$6.2	(59.20%)	(2.34%)
Versa Capital Fund II, L.P.	2008	(\$13.6)	\$100.7	(11.31%)	0.60%
Evergreen Pacific Partners, L.P.	2005	(\$10.8)	\$0.0	N/A	(99.99%)
Depreciation (Top 5)		(\$114.4)	\$211.9	(31.57%)	4.65%
Depreciation (Remaining 56)		(\$104.9)	\$653.4	(12.98%)	12.31%
Total Depreciation (61)		(\$219.3)	\$865.3	(19.42%)	11.65%
Total Portfolio (206)		\$1,345.6	\$7,642.4	18.47%	11.41%

¹ Performance relating to liquidated investments and investments generating no value change during the year are included within Total Portfolio return figures

Holdings Industry, Geographic and Public/Private Data

Industry Exposure by Exposed Market Value ¹

Sector	9/30/2017	12/31/2017	Change
Information Technology	18%	18%	-
Consumer Discretionary	16%	18%	2%
Industrials	13%	14%	1%
Health Care	13%	13%	-
Financials	10%	9%	(1%)
FoF Holding	8%	7%	(1%)
Energy	7%	7%	-
Materials	6%	5%	(1%)
Consumer Staples	5%	5%	-
Real Estate	1%	2%	1%
Telecommunication Services	1%	2%	1%

Geographic Exposure by Exposed Market Value ¹

Region	9/30/2017	12/31/2017	Change
North America	66%	65%	(1%)
Western Europe	20%	20%	-
Asia	9%	9%	-
Rest of World	5%	5%	-

Public/Private Holdings by Exposed Market Value ¹

Public/Private	9/30/2017	12/31/2017	Change
Private	92%	91%	(1%)
Public	8%	9%	1%

¹ Exposed Market Value is LP's share of Market Value at the Portfolio Holding Level. May not sum to 100% due to rounding.

Private Markets Portfolio Impact on PA

December 31, 2017 (\$M)	Private Equity*	Venture Capital	Special Situations	Total
Funds Headquartered in PA – Commitments Total	\$12,374.6	\$875.0	\$7,564.0	\$20,813.6
Funds Headquartered in PA – Commitments PSERS' Share	\$794.8	\$168.1	\$217.8	\$1,180.7
PA-based Investments – Total Value	\$22,096.5	\$934.5	\$11,601.0	\$34,632.0
PA-based Investments – PSERS' Market Share	\$1,398.0	\$142.9	\$313.2	\$1,854.1
Number of people employed	34,733	2,312	10,044	47,089
Payroll	\$489.9	\$82.1	\$75.3	\$647.3

Improvement picking funds from 2005 and 2006

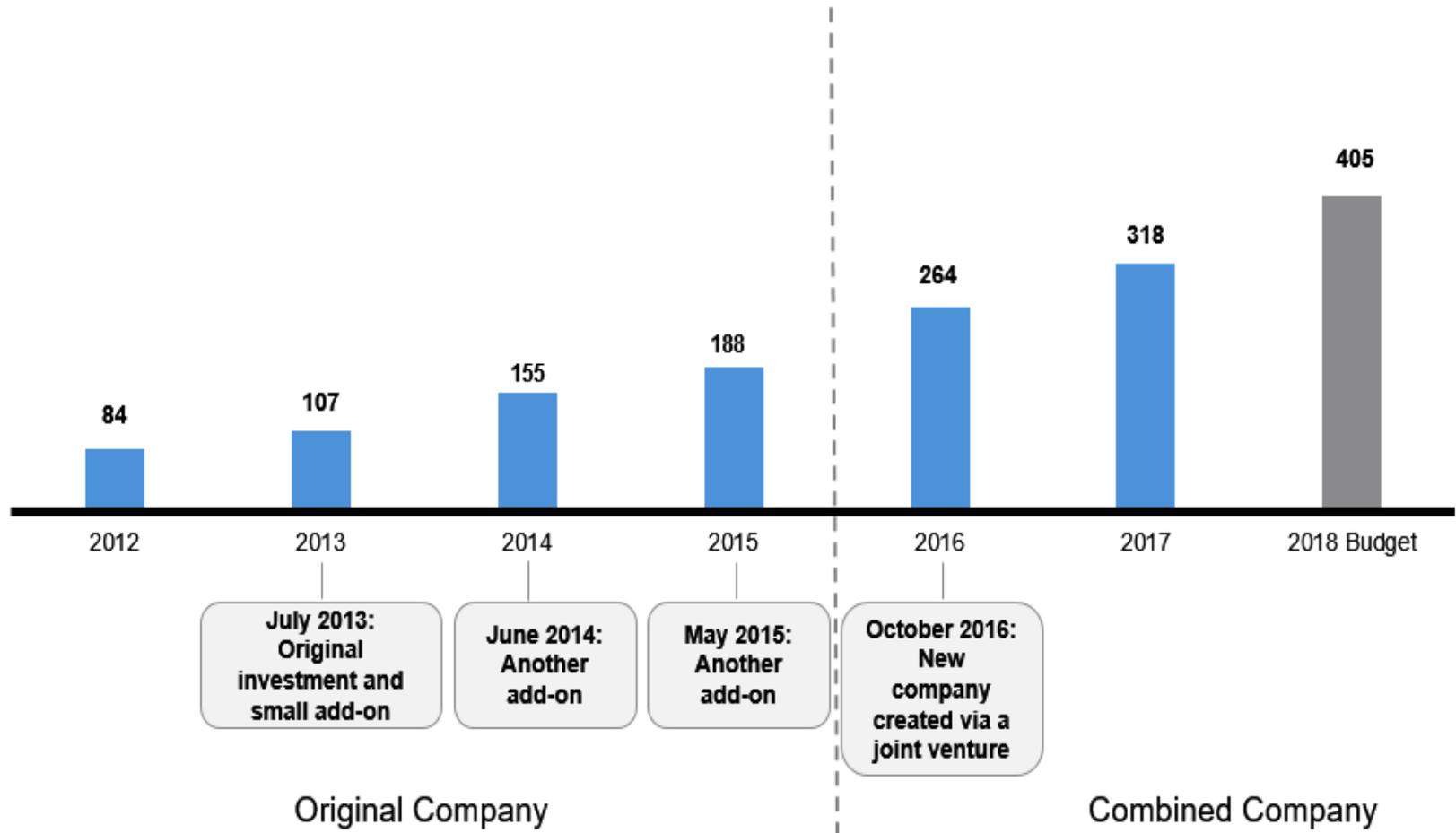
as of December 31, 2017

VY	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR	Quartile ¹
2005	282.3	1.3x	1.88%	16.13%	0.73%	3.66%	2.38%	5.71%	3rd
2006	456.9	1.4x	6.49%	22.68%	3.93%	7.96%	6.60%	5.97%	3rd
2007	679.0	1.4x	(1.23%)	5.11%	6.54%	8.25%	8.50%	8.12%	2nd
2008	\$890.2	1.4x	4.93%	16.70%	8.62%	10.21%	10.23%	10.23%	2nd
2009	172.4	2.0x	5.00%	19.25%	20.71%	19.94%	17.20%	17.20%	2nd
2010	10.1	1.1x	6.60%	(13.69%)	(11.43%)	2.13%	N/A	1.36%	4th
2011	607.6	1.4x	4.79%	17.93%	11.66%	13.12%	N/A	13.73%	2nd
2012	1,179.6	1.6x	7.97%	23.24%	17.13%	18.45%	N/A	18.14%	2nd
2013	934.5	1.4x	5.17%	24.27%	20.20%	18.35%	N/A	18.18%	1st
2014	618.1	1.4x	3.78%	21.00%	18.60%	N/A	N/A	20.96%	1st
2015	910.2	1.2x	5.76%	23.07%	13.45%	13.07%	N/A	13.07%	2nd
2016	590.9	1.3x	10.84%	35.75%	N/A	N/A	N/A	34.51%	1st

¹ Source: Hamilton Lane Benchmark – All PE excluding Real Estate as of December 31, 2017

Sample growth of a consumer company

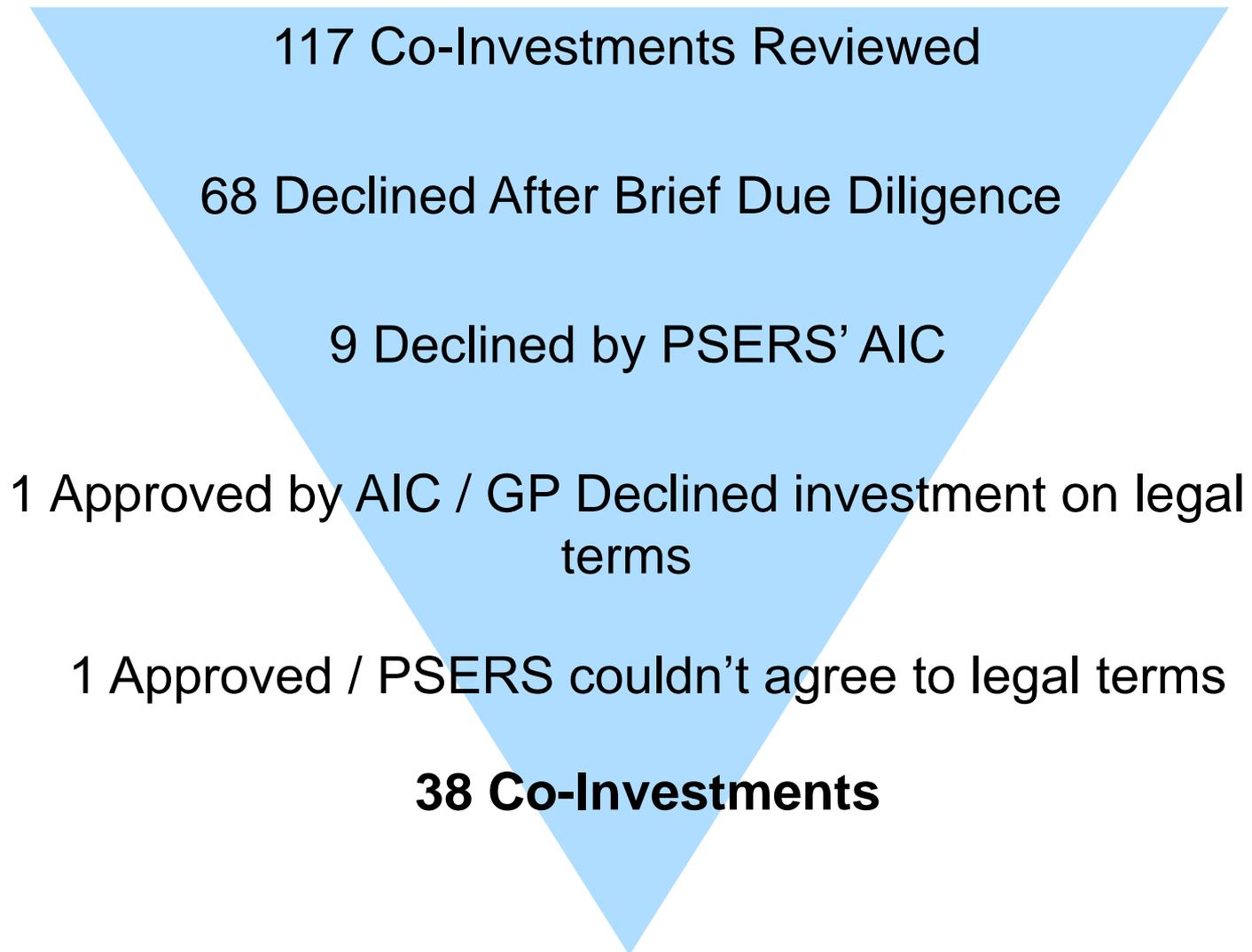
EBITDA evolution (in millions)



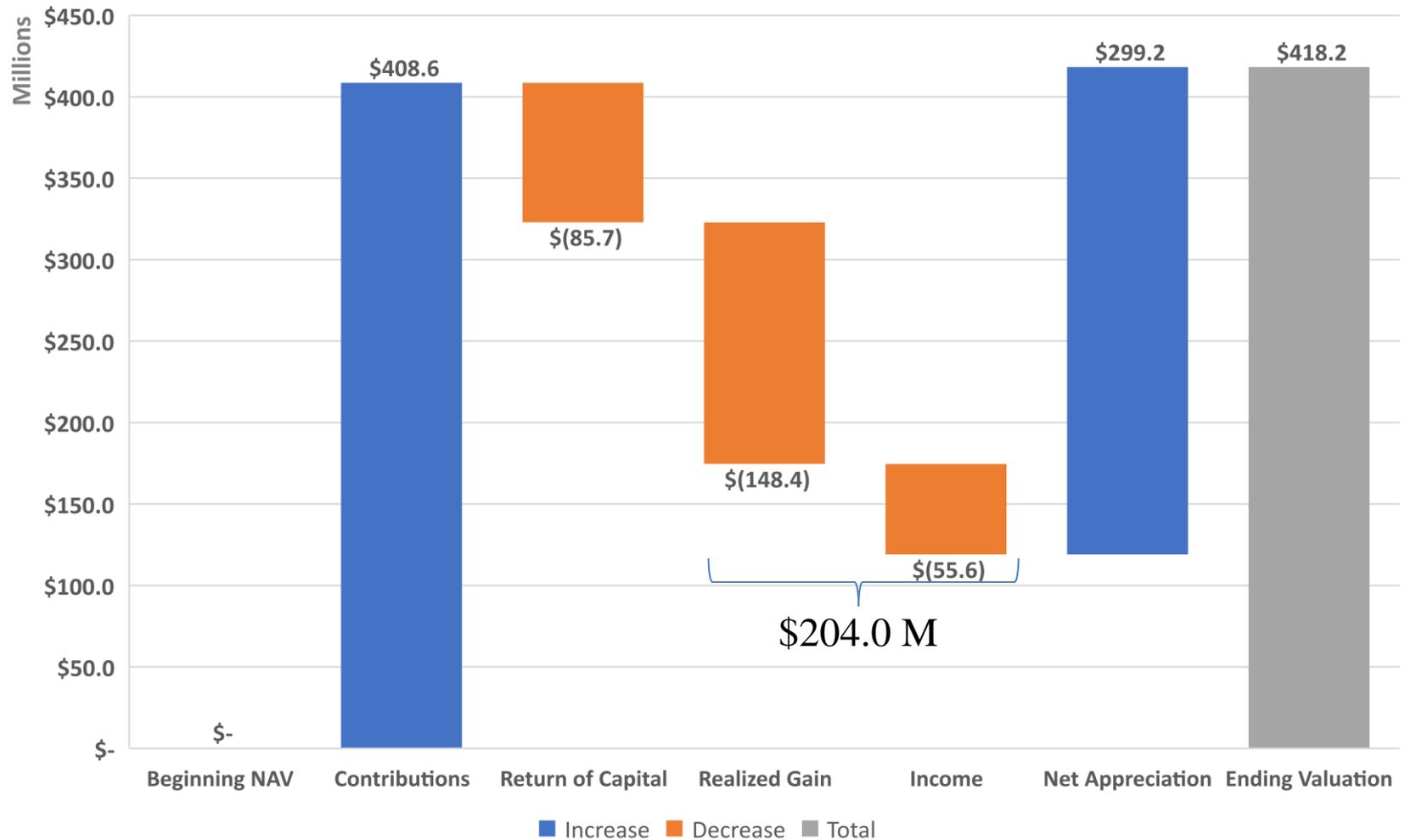
Internal Co-Investments: 2012 – 2016 ‘Fund I’

Fund 1 Investments	Vintage	Commitment	Cumulative Contributions	Cumulative Distributions	Valuation	IRR	TVPI	DPI
Fund 1								
Realized								
Fund 1	2014	15,000,000	12,086,263	42,224,684	1,088,831	46.07	3.58	3.49
Fund 1	2014	13,000,000	13,035,722	94,207,284	-	90.60	7.23	7.23
Fund 1	2012	13,714,735	13,878,761	33,036,817	-	44.43	2.38	2.38
Fund 1	2012	8,701,022	10,000,061	25,540,380	-	22.48	2.55	2.55
Fund 1	2012	10,000,000	7,500,000	12,669,791	223,183	11.78	1.72	1.69
Fund 1	2013	11,252,164	10,161,660	18,637,634	-	16.06	1.83	1.83
Total Realized		70,449,183	66,662,467	226,316,590	1,312,014	39.89	3.41	3.39
Total Partially Realized and Unrealized		307,054,300	264,415,824	63,290,618	336,130,905	19.73	1.51	0.24
Fund 1 Total		377,503,483	331,078,290	289,607,208	337,442,918	28.36	1.89	0.87

Co-Investments Deal Flow Funnel Since Inception Feb 2012 – Dec 2017



Since Inception (Feb 2012) Co-Investments NAV Bridge as of December 31, 2017



Excludes Pennsylvania Co-Invest and Currency Hedge

Performance Summary by Vintage Year as of December 31, 2017

VY	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR	Quartile ¹
1985	-	6.1x	N/A	N/A	N/A	N/A	N/A	17.08%	1st
1986	-	1.0x	N/A	N/A	N/A	N/A	N/A	0.30%	4th
1987	-	2.6x	N/A	N/A	N/A	N/A	N/A	12.58%	2nd
1988	-	1.5x	N/A	N/A	N/A	N/A	N/A	9.21%	3rd
1989	-	0.7x	N/A	N/A	N/A	N/A	N/A	(4.17%)	4th
1991	-	2.6x	N/A	N/A	N/A	N/A	N/A	22.19%	2nd
1992	\$0.6	2.0x	8.23%	(43.19%)	(17.33%)	(15.56%)	(5.52%)	24.79%	2nd
1993	-	2.4x	N/A	N/A	N/A	(18.36%)	9.04%	24.20%	1st
1994	-	1.8x	N/A	N/A	(2.58%)	4.81%	(14.42%)	16.46%	3rd
1995	0.1	1.5x	(3.15%)	(42.88%)	(8.93%)	(11.91%)	(5.58%)	14.98%	2nd
1996	0.4	1.1x	7.72%	(2.33%)	(31.73%)	(16.65%)	(11.34%)	3.10%	3rd

¹ Source: Hamilton Lane Benchmark – All PE excluding Real Estate as of December 31, 2017

Performance Summary by Vintage Year as of December 31, 2017

VY	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR	Quartile ¹
1997	\$0.3	1.3x	32.86%	31.05%	11.58%	(18.03%)	1.40%	7.26%	3rd
1998	0.4	1.3x	(40.33%)	(32.12%)	(7.17%)	3.19%	(8.21%)	6.04%	3rd
1999	4.9	1.4x	(27.99%)	(26.79%)	(9.76%)	(3.87%)	(3.67%)	6.75%	2nd
2000	85.2	1.5x	(11.12%)	0.86%	(3.65%)	3.74%	0.47%	9.27%	2nd
2001	9.9	2.2x	(5.21%)	(2.58%)	(4.33%)	5.11%	3.17%	24.25%	1st
2002	7.0	2.0x	(2.99%)	6.09%	10.10%	9.78%	1.70%	22.92%	1st
2003	43.0	1.5x	7.45%	13.81%	5.81%	8.69%	(1.11%)	11.67%	2nd
2004	23.9	1.9x	4.06%	(1.18%)	2.52%	2.05%	10.43%	17.34%	1st
2005	282.3	1.3x	1.88%	16.13%	0.73%	3.66%	2.38%	5.71%	3rd
2006	456.9	1.4x	6.49%	22.68%	3.93%	7.96%	6.60%	5.97%	3rd
2007	679.0	1.4x	(1.23%)	5.11%	6.54%	8.25%	8.50%	8.12%	2nd

¹ Source: Hamilton Lane Benchmark – All PE excluding Real Estate as of December 31, 2017

Performance Summary by Vintage Year

as of December 31, 2017

VY	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR	Quartile ¹
2008	\$890.2	1.4x	4.93%	16.70%	8.62%	10.21%	10.23%	10.23%	2nd
2009	172.4	2.0x	5.00%	19.25%	20.71%	19.94%	17.20%	17.20%	2nd
2010	10.1	1.1x	6.60%	(13.69%)	(11.43%)	2.13%	N/A	1.36%	4th
2011	607.6	1.4x	4.79%	17.93%	11.66%	13.12%	N/A	13.73%	2nd
2012	1,179.6	1.6x	7.97%	23.24%	17.13%	18.45%	N/A	18.14%	2nd
2013	934.5	1.4x	5.17%	24.27%	20.20%	18.35%	N/A	18.18%	1st
2014	618.1	1.4x	3.78%	21.00%	18.60%	N/A	N/A	20.96%	1st
2015	910.2	1.2x	5.76%	23.07%	13.45%	13.07%	N/A	13.07%	2nd
2016	590.9	1.3x	10.84%	35.75%	N/A	N/A	N/A	34.51%	1st
2017	134.8	1.0x	1.08%	3.43%	N/A	N/A	N/A	3.36%	2nd
Total	\$7,642.4	1.5x	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%	

¹ Source: Hamilton Lane Benchmark – All PE excluding Real Estate as of December 31, 2017

Performance Summary by Active Manager as of December 31, 2017

Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
ABS Ventures	\$0.3	1.2x	18.30%	10.53%	(29.05%)	(14.57%)	(17.88%)	6.72%
Actis LLP	116.6	1.1x	(0.87%)	0.27%	(6.10%)	(1.69%)	N/A	1.74%
Adams Capital Management, Inc.	0.3	1.8x	32.86%	31.05%	10.58%	(18.26%)	(17.12%)	44.80%
Aisling Capital LLC	99.6	1.5x	4.37%	50.47%	11.73%	20.57%	6.13%	15.78%
APAX Partners LLP	56.7	1.5x	(1.05%)	(29.92%)	(0.18%)	7.83%	4.96%	4.98%
Apollo Global Management, LLC	194.9	1.4x	10.38%	32.46%	22.31%	N/A	N/A	20.39%
Arrowhead Mezzanine	0.9	1.4x	11.08%	74.25%	46.50%	15.74%	11.67%	10.64%
Avenue Capital Group	12.3	1.4x	6.13%	(10.33%)	(9.49%)	2.54%	9.60%	8.81%
Bain Capital Partners LLC	247.2	1.7x	14.11%	57.51%	36.03%	30.45%	N/A	29.28%
Baring Private Equity Asia Limited	320.9	1.6x	5.49%	19.64%	8.13%	9.41%	7.95%	16.14%
Black Diamond Capital Management, LLC	1.6	1.4x	0.27%	25.43%	2.24%	4.64%	2.21%	9.13%
Blue Point Capital Partners LLC	78.5	2.2x	11.89%	41.68%	30.62%	33.08%	14.70%	15.32%

Performance Summary by Active Manager as of December 31, 2017

Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Bridgepoint Capital Ltd	\$480.9	1.6x	6.74%	17.30%	7.07%	7.53%	3.14%	15.13%
Capital Group	84.4	0.9x	1.18%	(1.91%)	(10.31%)	(7.64%)	(1.69%)	(1.99%)
Cerberus Capital Management, LLC	391.1	2.0x	7.00%	18.87%	12.66%	12.24%	9.86%	17.53%
Cinven	140.7	1.5x	14.96%	35.54%	21.74%	11.48%	9.44%	9.31%
Clearlake Capital Group, L.P.	46.1	1.3x	1.83%	25.39%	N/A	N/A	N/A	29.79%
Coller Investment Management LTD	77.4	1.5x	3.09%	17.07%	11.89%	13.79%	N/A	17.06%
Crestview Advisors LLC	269.2	1.7x	3.34%	15.23%	16.18%	15.59%	11.95%	11.27%
Cross-Atlantic Capital Partners	105.2	1.3x	1.20%	(4.98%)	(7.99%)	5.61%	(0.69%)	4.61%
CVC Capital Partners Group	197.6	1.7x	10.87%	38.56%	25.24%	19.37%	14.89%	14.89%
Denham Capital	75.4	1.2x	1.29%	0.57%	11.31%	12.50%	N/A	10.90%
EagleTree Capital	-	1.6x	N/A	N/A	22.04%	20.63%	(0.41%)	14.12%
Energy & Minerals Group, The	80.5	0.9x	2.75%	5.44%	(3.46%)	N/A	N/A	(3.39%)

Performance Summary by Active Manager as of December 31, 2017

Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Equistone Partners Europe Limited	\$74.0	1.3x	3.29%	34.30%	N/A	N/A	N/A	18.94%
Evergreen Pacific Partners GP LLC	26.0	1.3x	(7.16%)	(13.89%)	2.83%	1.41%	3.96%	5.20%
First Reserve Corporation	65.5	0.7x	(0.29%)	(5.25%)	(21.59%)	(14.81%)	N/A	(8.32%)
Gold Hill Venture Lending 03, LLC	1.3	1.6x	70.98%	41.71%	15.25%	99.06%	13.52%	10.82%
GoldPoint Partners, L.L.C.	107.5	1.5x	5.02%	20.84%	14.26%	11.61%	5.13%	10.41%
Hamilton Lane (PA coinvest)	60.2	1.7x	8.53%	51.67%	N/A	N/A	N/A	39.82%
HgCapital	163.2	1.4x	13.20%	32.52%	22.15%	N/A	N/A	17.92%
Huntsman Gay Global Capital LLC	112.3	1.2x	1.18%	7.89%	N/A	N/A	N/A	12.10%
Incline Management Corp	65.1	1.8x	6.38%	45.08%	43.66%	28.58%	17.89%	16.68%
IPC Advisors	95.6	1.6x	7.21%	26.77%	18.54%	11.33%	5.65%	10.86%
KBL Healthcare	1.7	0.6x	(51.97%)	(44.26%)	(21.49%)	(11.63%)	(6.98%)	(6.68%)
L Catterton Management Company LLC	462.7	1.4x	1.45%	0.49%	3.17%	7.44%	9.72%	8.90%

Performance Summary by Active Manager as of December 31, 2017

Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Landmark Partners	\$75.0	1.5x	0.51%	4.89%	(0.49%)	6.27%	6.46%	7.24%
Lindsay Goldberg & Bessemer	0.1	2.3x	1106.91%	(19.78%)	22.88%	12.52%	5.32%	34.18%
LLR Partners	274.9	1.7x	6.97%	30.19%	19.63%	15.42%	13.21%	17.86%
Mid-Atlantic Venture Funds	0.6	5.0x	8.23%	(43.19%)	(17.33%)	(15.52%)	(5.41%)	38.02%
Milestone Partners	90.2	1.5x	3.05%	30.11%	11.64%	5.51%	N/A	6.79%
Morgan Stanley	84.9	1.8x	2.63%	8.55%	9.20%	11.62%	4.20%	16.71%
New Mountain Investments	346.4	1.8x	2.85%	21.23%	26.44%	17.87%	13.69%	14.12%
NGP Energy Capital Management	157.1	1.2x	6.91%	19.78%	10.59%	9.75%	N/A	9.86%
Oaktree Capital Management LP	22.7	1.6x	(0.52%)	10.25%	(1.80%)	3.76%	14.05%	13.75%
Odyssey Investment Partners, LLC	48.7	0.8x	(3.45%)	(19.55%)	(16.42%)	N/A	N/A	(17.44%)
Orchid Asia	46.2	1.4x	2.73%	10.64%	17.90%	29.88%	N/A	24.08%
PAI Europe	193.2	2.4x	7.52%	49.86%	23.57%	17.41%	8.12%	10.52%

Performance Summary by Active Manager as of December 31, 2017

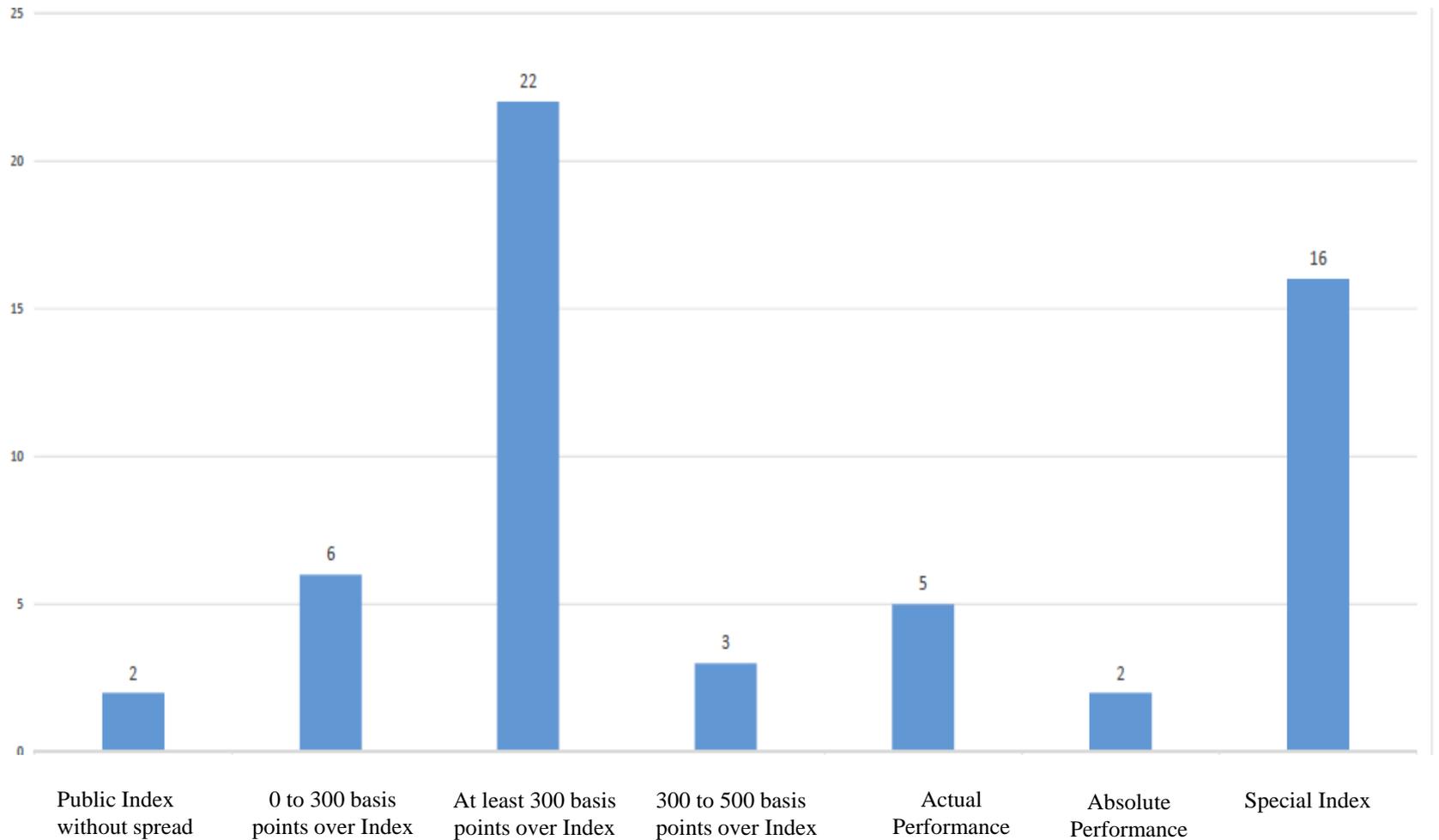
Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Palladium Equity Partners	\$107.6	1.8x	(1.17%)	26.34%	5.18%	8.65%	20.14%	9.03%
Partners Group Mgt VI LTD	114.5	1.5x	4.18%	20.82%	5.88%	10.49%	N/A	10.69%
Partners Group Client Access Mgt I LTD	19.6	2.5x	4.43%	16.25%	17.30%	24.58%	N/A	34.13%
Permira	38.0	1.6x	4.20%	25.27%	21.71%	15.96%	10.26%	8.82%
Platinum Equity Advisors, LLC	285.7	1.8x	(2.26%)	2.61%	16.31%	19.42%	17.29%	30.69%
Portfolio Advisors, LLC	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Psilos Group Investors	51.7	1.2x	(7.04%)	(14.56%)	(5.04%)	(3.34%)	4.53%	3.41%
Quaker Bio-Ventures, Inc.	37.4	0.8x	4.01%	(6.46%)	(4.82%)	15.48%	(3.71%)	(3.77%)
SCP Private Equity Partners	22.8	0.5x	(8.49%)	(9.77%)	(12.96%)	(11.11%)	(10.57%)	(7.83%)
Searchlight Capital Partners, L.P.	37.4	1.5x	12.68%	47.33%	N/A	N/A	N/A	35.96%
StarVest Associates	44.7	1.3x	(8.50%)	(9.06%)	7.37%	7.00%	1.21%	5.21%
StepStone Group	16.9	0.9x	3.61%	3.86%	(5.76%)	(3.15%)	(3.78%)	(2.97%)

Performance Summary by Active Manager

as of December 31, 2017

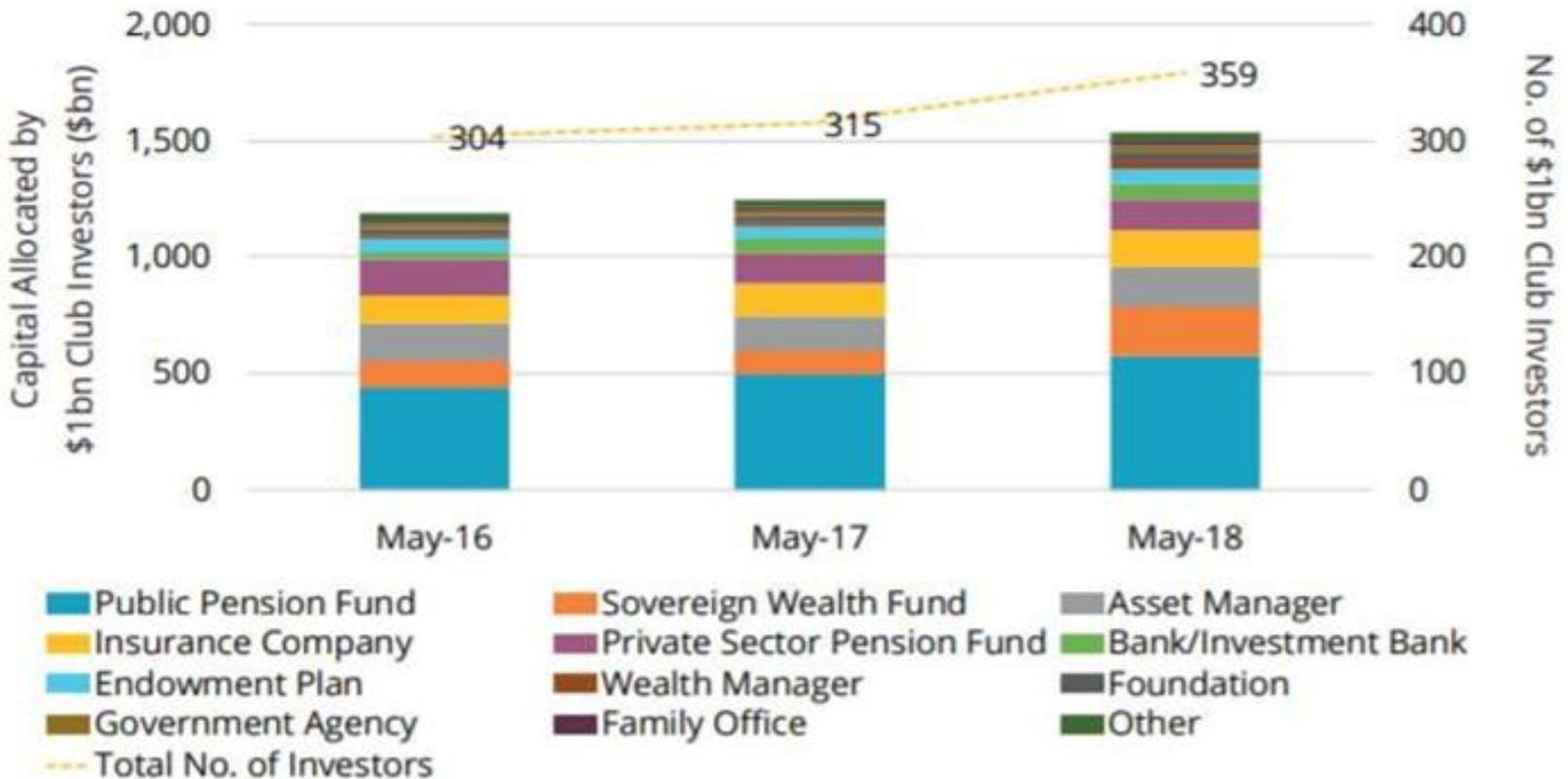
Fund Manager	NAV	MoC	1 QTR IRR	1 YR IRR	3 YR IRR	5 YR IRR	10 YR IRR	Since Inception IRR
Sterling Partners	\$7.2	1.7x	(3.95%)	(19.81%)	(34.14%)	(19.72%)	(1.18%)	12.20%
Strategic Partners	314.7	1.6x	8.61%	19.64%	8.84%	11.48%	6.19%	17.78%
Summit Partners	152.9	1.7x	8.01%	38.75%	28.15%	23.83%	N/A	23.26%
TDH, Inc.	-	0.7x	N/A	N/A	N/A	(44.20%)	45.21%	(5.23%)
Tenaya Capital	171.7	1.6x	10.51%	13.87%	6.28%	8.89%	10.86%	10.23%
Trilantic Capital Management LLC	99.3	1.5x	5.65%	36.96%	15.28%	12.98%	15.67%	15.15%
Venor Capital Management LP	117.6	1.2x	6.19%	9.17%	N/A	N/A	N/A	10.63%
Versa Capital Management, LLC	217.3	1.0x	1.24%	(4.18%)	(11.07%)	(6.55%)	(0.54%)	0.32%
Windjammer Capital Investors	131.9	1.6x	7.49%	34.56%	19.85%	17.83%	18.19%	16.57%
Total	\$7,642.4	1.5x	4.82%	18.47%	10.53%	10.45%	7.05%	11.41%

PE Benchmarks – Public Funds over \$8B



Number of LP's with \$1B or more allocated to PE

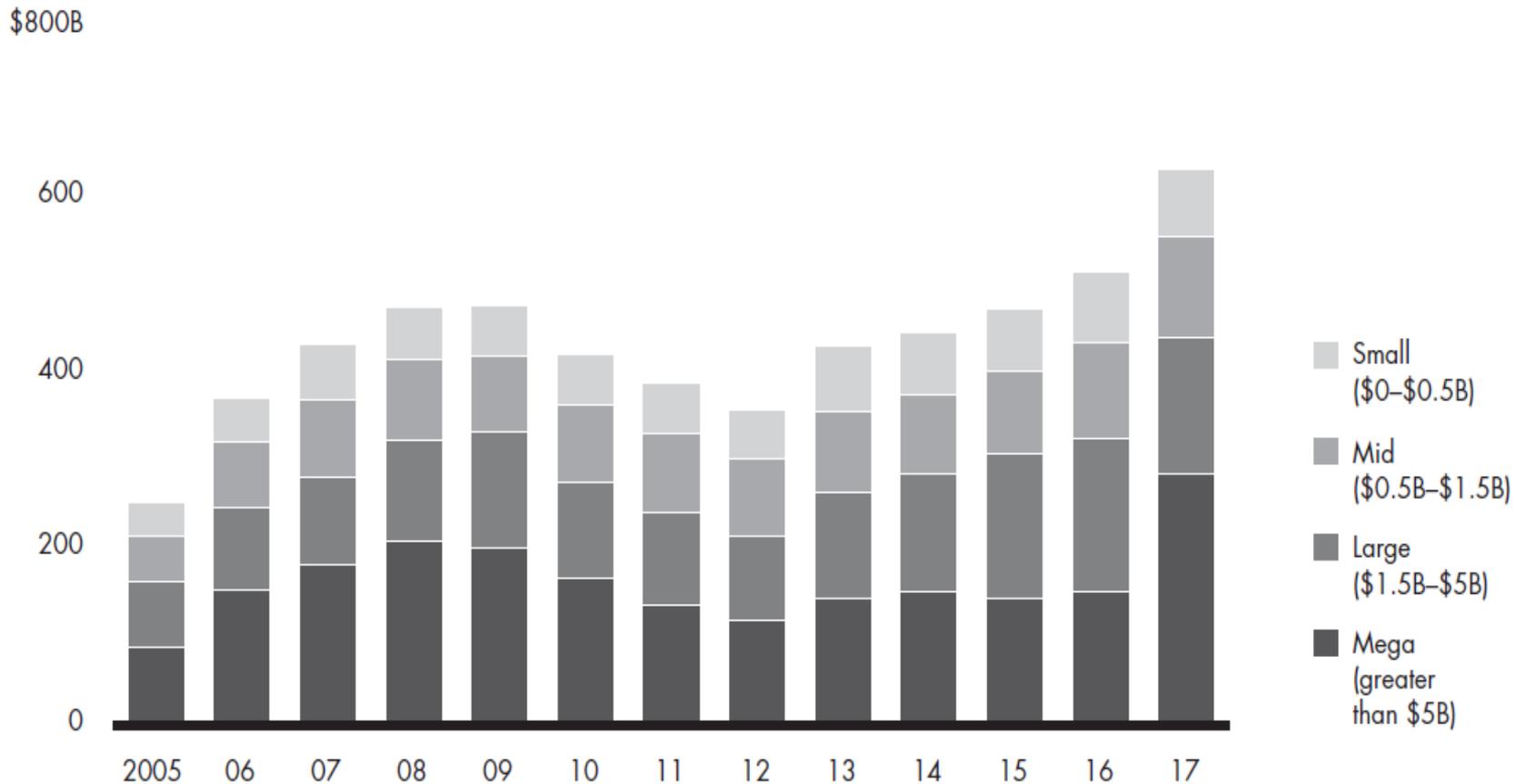
Fig. 1: Capital Allocation of \$1bn Club Investors by Investor Type, 2016 - 2018 (As at May 2018)



Source: Preqin

Dry Powder (investible amount) – Global Buyout Funds

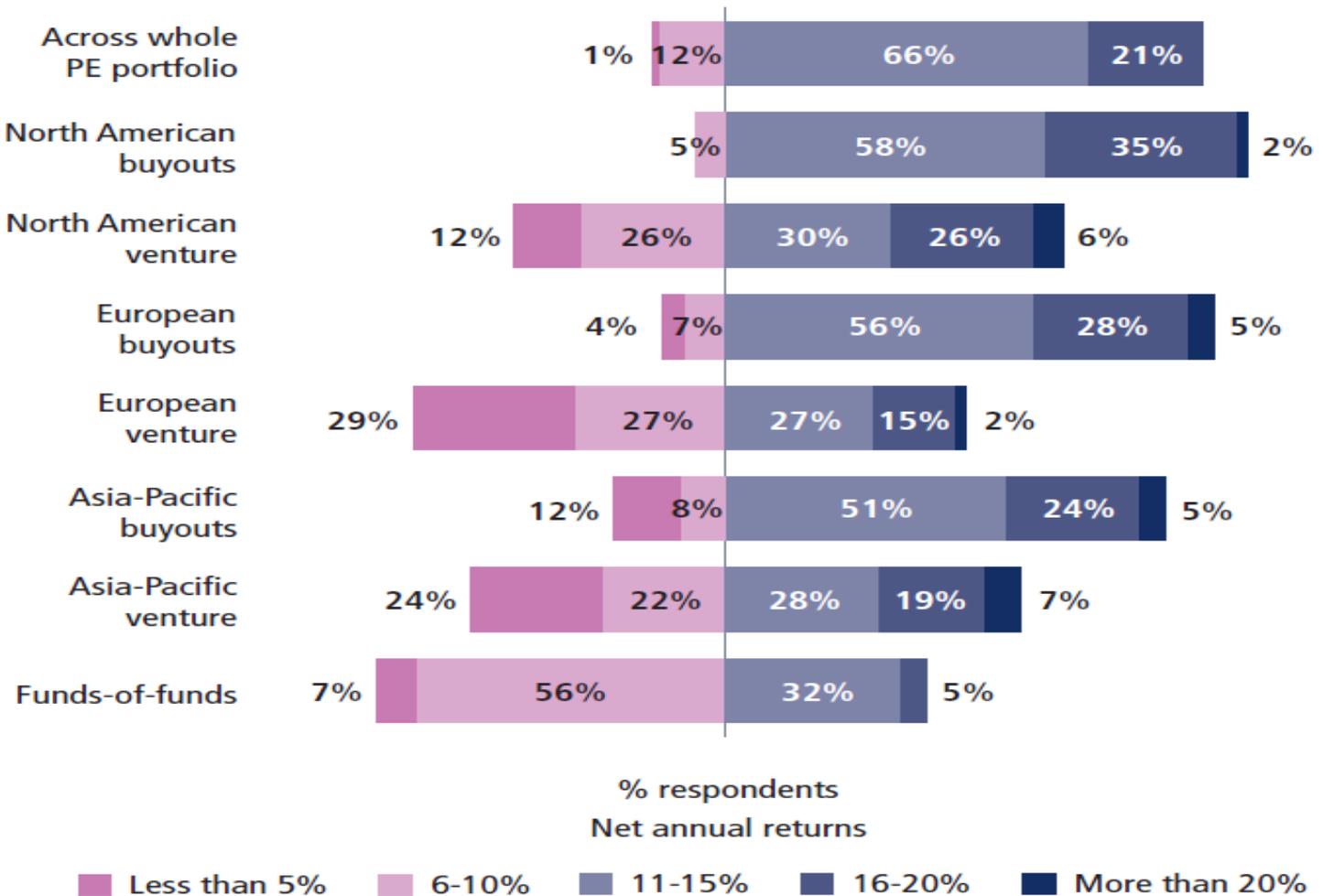
Global buyout dry powder (by fund size)



Source: Preqin

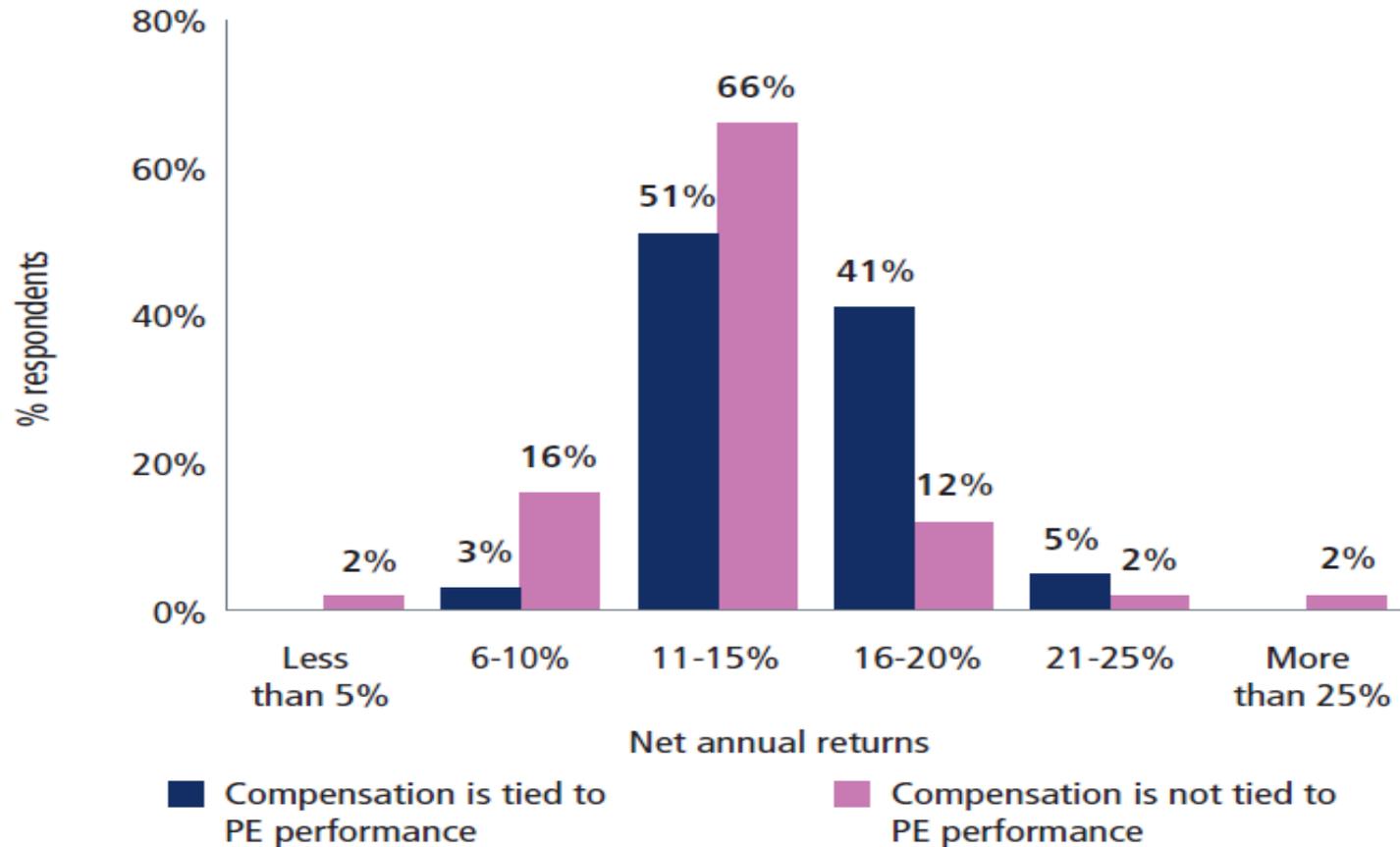
Net Annual IRRs Across PE Portfolios (Since Inception)

Net annual returns across LPs' PE portfolios since their inception



LP's 5-Year Net IRRs – With performance pay and without

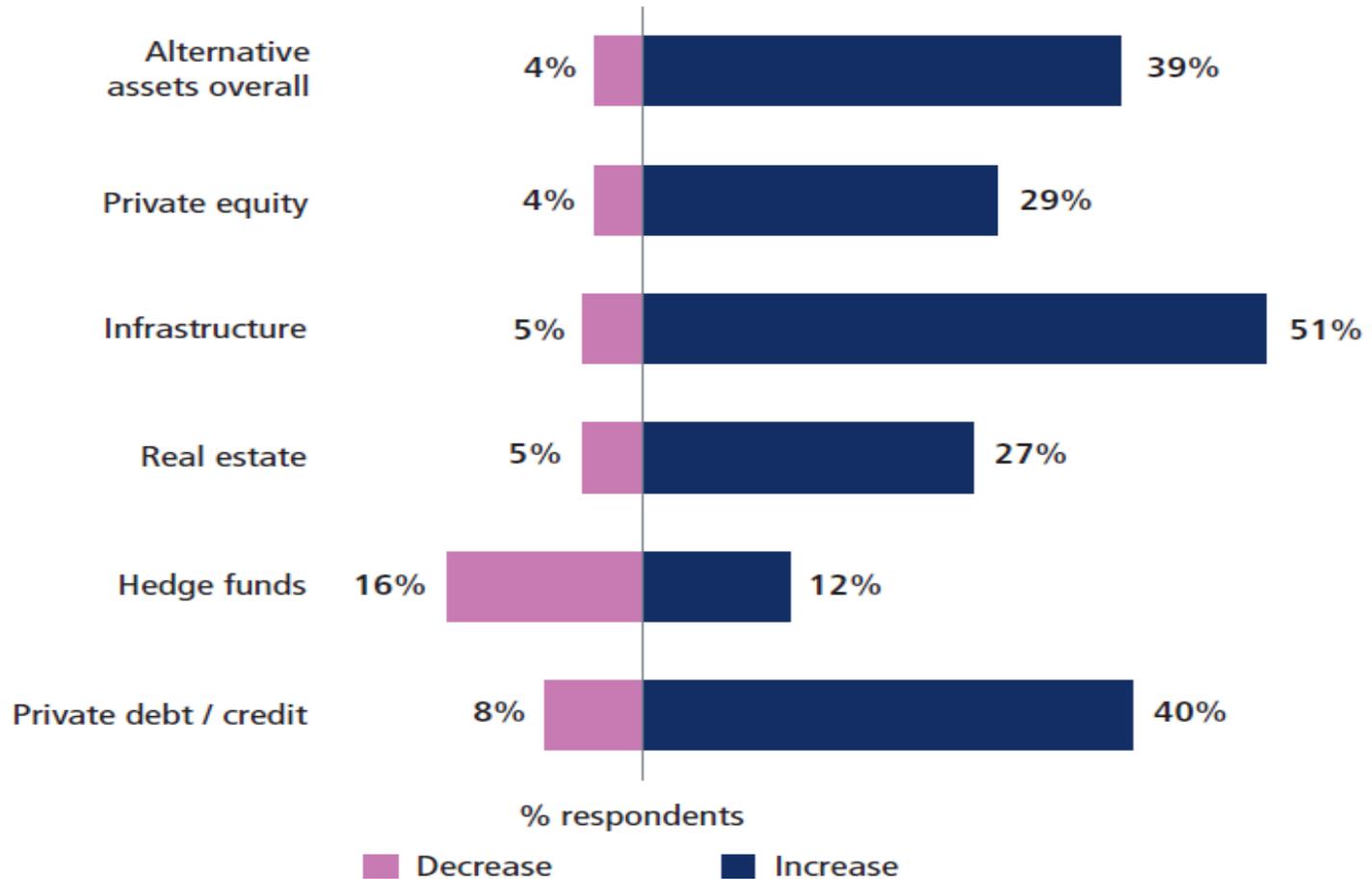
LPs' 5-year net PE portfolio performance correlated with incidence of performance-related pay



Source: Collier Capital

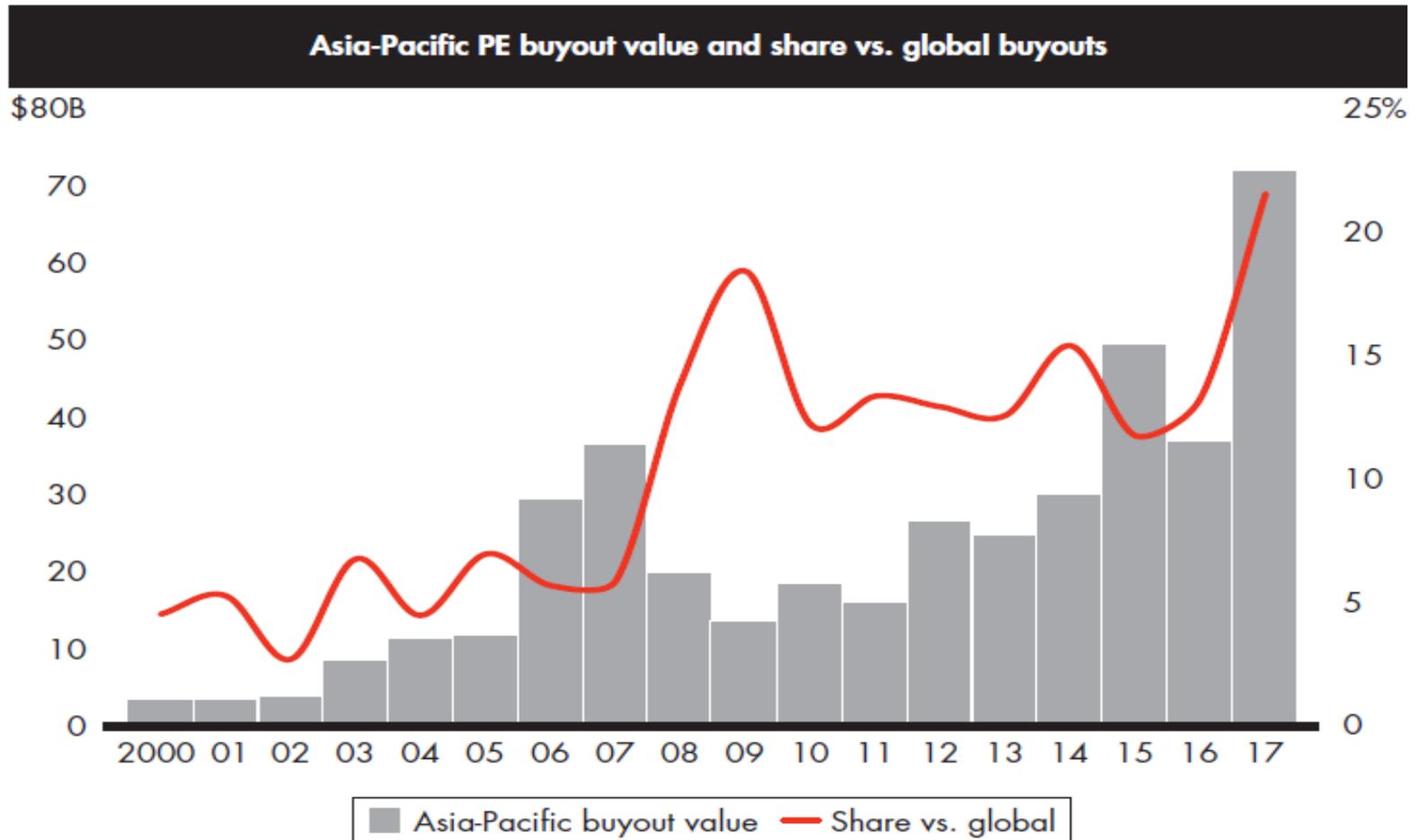
Changes in LP's target allocations to alternatives

Changes in LPs' planned target allocations to alternative assets over the next 12 months



Source: Collier Capital

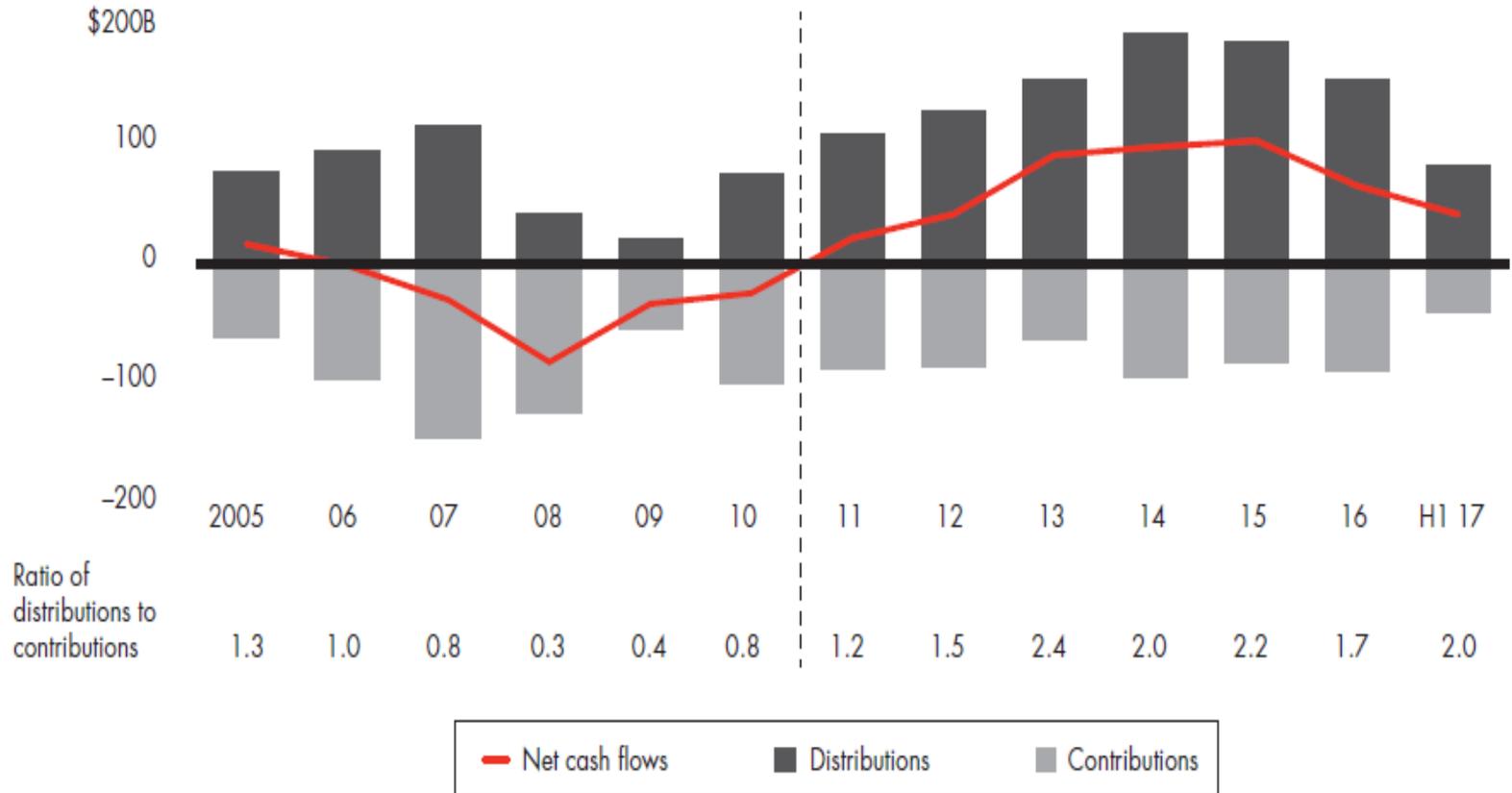
Asia Buyout Value Hit a New High



Source: Bain Asia-Pacific PE Report 2018

PM investors have been cash flow positive

Capital contributions and distributions (global buyout funds)

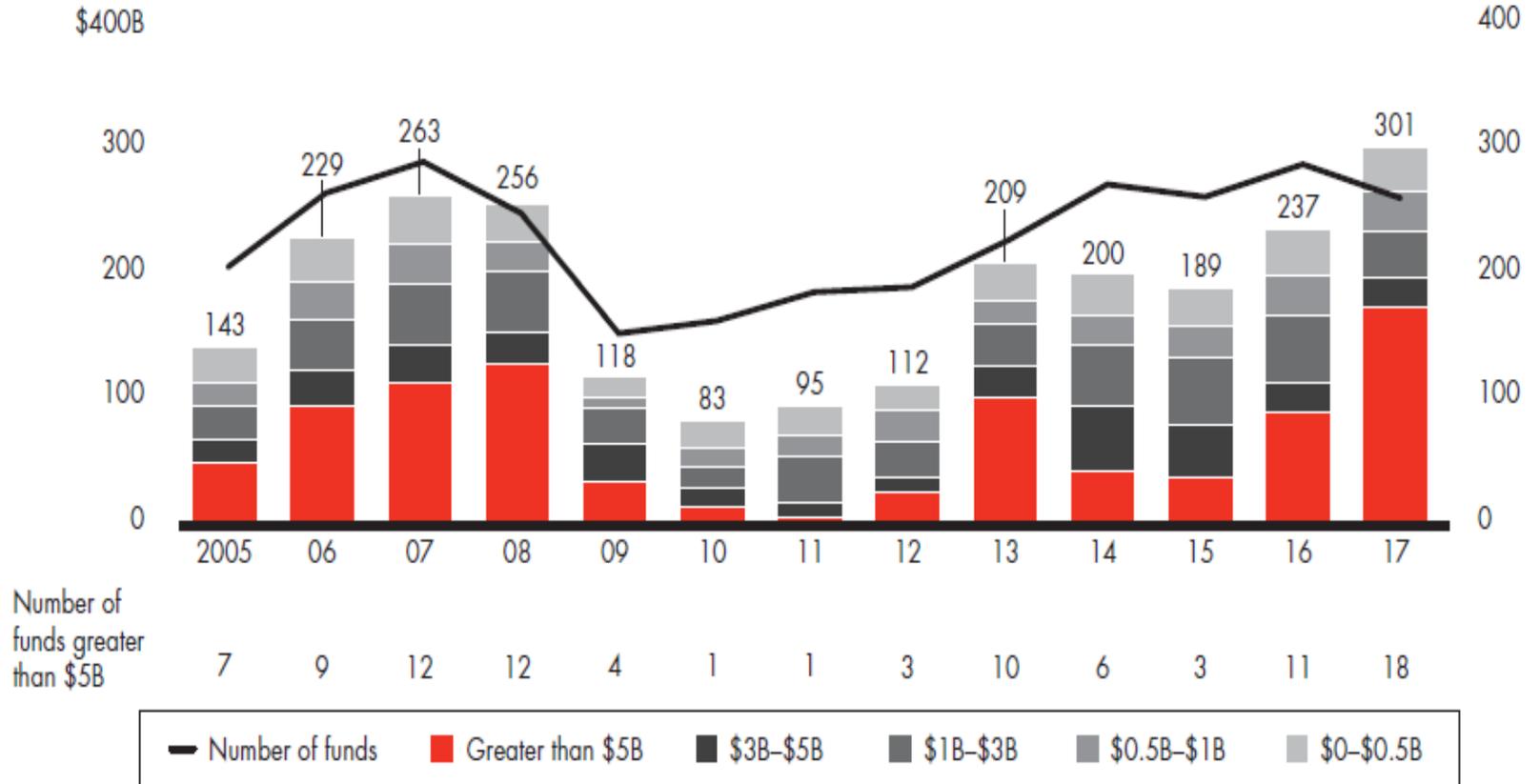


Source: Cambridge Associates Private Investments Database

Mega-Funds dominated fund raising in 2017

Global buyout capital raised (by fund size)

Number of global buyout funds raised



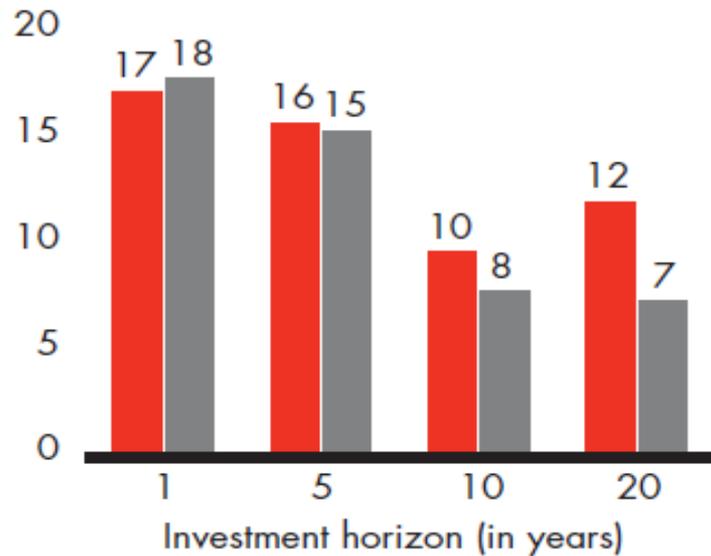
Notes: Includes funds with final close and represents the year in which funds held their final close; buyout includes buyout and balanced funds

Source: Preqin

Buyout Funds vs PME

US

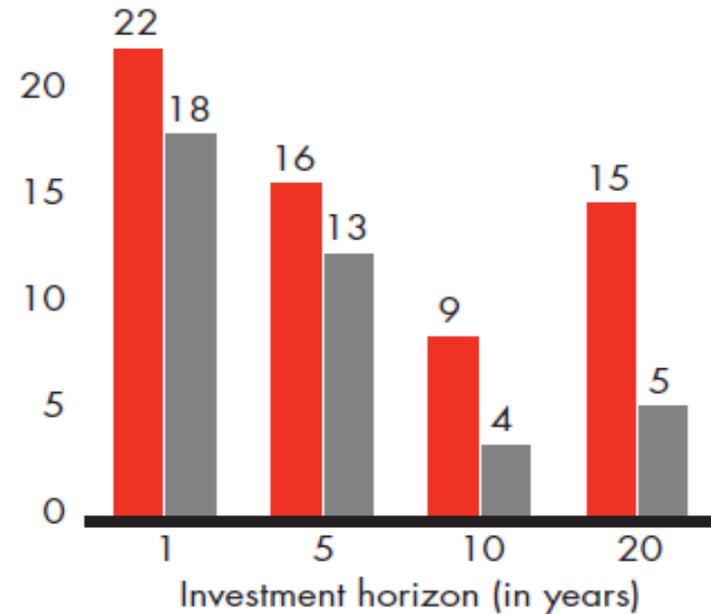
End-to-end pooled net IRR (as of June 2017)
25%



■ US buyout funds ■ S&P 500 mPME

Europe

End-to-end pooled net IRR (as of June 2017)
25%



■ Developed Europe buyout funds ■ MSCI Europe mPME

Source: Cambridge Associates



COMMONWEALTH OF PENNSYLVANIA
PUBLIC SCHOOL EMPLOYEES' RETIREMENT SYSTEM

Private Markets Asset Class Review Year-End 2017

Darren Foreman, MBA, CAIA

Luke Jacobs, MBA, CFA

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Tony Meadows

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October 11, 2018

NEXT